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American Bee Journal

VOLUME 150 NO. 11 NOVEMBER 2010

In This Issue:

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November Cover Picture

A honey bee and a yellow-faced bumble bee share a purple coneflower. This beautiful photo was taken by Kathy Keatley Garvey at the newly opened Honey Bee Haven garden on the UC-Davis Campus. See story and more photos in this issue.

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Send your letters to the editor, Attn: Joe Graham, Dadant, 51 S. 2nd Street, Hamilton, IL 62341, Fax: 1-217-847-3660, or email: abj@dadant.com.

Due to size and content, we may be unable to publish all information received. Thank You!

FIRE DESTROYS HIVES

On Aug. 28, 2010 I noticed some smoke north of my property. I thought it was odd that they were allowed to have a burn permit. I thought about it for a bit and then it clicked that burn permits were not issued right now, nor is fire allowed out here this time of year. I jumped in the truck and went to investigate. The fire was just starting to get out of control. A road grader was moving very fast trying to make a fire break and I mean this thing was moving! The fire was towering over the road grader and it made it look like a little toy out in the field.

The wind was blowing very hard and just fueling that fire! The ground speed of the fire was moving between 4 and 6 miles per hour, showing no sign of slowing down. I knew it was going to be a bad fire and it was headed to some houses near my property. At that time, I never thought it would reach my property.

I raced back home (I'll admit I was speeding well beyond the speed limit). I had to pull my tractor off some other equipment and hook it up to the plow. I had my two kids (6 year old daughter, and 2 year old son) with me, because my wife was working. We took off cutting through my field to get to the neighbor's houses as fast as I could. I was doing about 15 mph through the field just pushing that tractor for all it was worth! It took about 15 minutes to get over to the houses.

I started plowing around the houses and around some wheat fields creating a fire break about 60 feet wide. By the time I got a second pass done, the fire was bearing down on us. The alternator light then came on and started to beep at me. I was watching these huge flames near me and I had my kids with me. All I could think about was "please don't die, please don't die". I'm only 33 years old, but I have a bad back and no way could I run with two kids.

The fire stopped at the fire break I created. By now several other farmers had joined the battle. In just two hours the fire reached my property. I knew now that it was headed right for my bee hives. They are in several locations.

The Bureau of Land Management (BLM), Forest Service, police, fire, and fire planes have now shown up. I jumped out of my tractor and told them I have bee hives that I would like to save. They told me "that is the least of the problems right now. We are not going to put people in front of the fire." I did understand though. I was not going to get in front of that fire either.

We were able to keep the fire from reaching two of my apiaries. But my third apiary was directly in the path. I pushed that tractor trying to get up there in time to make a path around my hives. The fire was too fast though. I wasn't even 1/2 way there when it went across the apiary. By the time I reached the hives, the fire was there and gone. I kept hoping on my way that the fire was moving so fast that the hives would not have time to catch fire. I also hoped that the bees would get out in time, but to no avail.

When I arrived to the area my heart just sank. I felt so sick, I just can't describe it. All the brush and trees were gone. All the choke cherry trees were gone and my favorite "lone pine tree", was gone. All my hives, that were stacked so high, even one higher than I, were not in sight. We are talking less that 20 minutes time after the fire went across there. I still have to harvest my honey. I know I'm late, but I have been so busy with harvesting wheat, that I was waiting for a rainy day. This way I would not be able to cut wheat, but I could work with the bees and extract the honey.

I only have 60 hives. The fire burned 20 of my hives. I've attached some pictures of the burnt hives, or what was left. They were still smoldering when I took the picture. You could see the river of honey and wax that flowed from each hive. The honey turning to candy because of the heat. The fire was so hot and intense, that I know the bees didn't have time to get out. It even melted some of the tin on the roofs of the hives. Just amazing! Anyone who owns bees knows the work involved in setting them up and working with them. Talk about a heartbreak to see all of that work go up in smoke!

It was my best apiary out of all of them. My best hive was also in that section. I had already taken 210 lbs. of honey off of that hive and was planning on more! No kidding either! I have never seen or had such a good hive! It had tons of bees, excellent production, and excellent cleanliness.

I had hoped to get my little hobby up to 100 hives by next summer. Now I'm down to 40. I had them in a good cover area to protect them, but I guess it came back to bite me. Just be prepared for a fire, because you never know when it will happen, and if you are like me, you will think it will never happen to you.

This is something that I had never thought of until this happened. Insurance on the hives! I have used the Farm Service Agency and insured the bees, but I never thought of insuring the actual hive. I had the 60 hives and 20 of them burned up. When you add the lost rev-

(l) After a fire near Arbon, ID, Ryan Weston said he discovered that 20 of his hives had been totally destroyed. The above picture shows only a few metal hive cover lids remaining. (r) The same scene, but from farther away.

enue from honey, bees, and all the components of the hives, then it added up to a large amount of honey. My insurance only covered 1/2 of the true value of the honey and hives. The insurance company went to a local company and asked them what they sell the honey for. They quoted them 1.25 per lb for wholesale. So, that is what the insurance company used as a price. I sell (retail) my honey at $4.50 a lb. I don't wholesale any of my honey. This was a huge loss to me!

Next they went online and found some companies to buy bee hives. They found the cheapest most inexpensive hives and parts they could find. These were less than mine again. I've built a lot of my hives. I build the boxes, inner and outer covers, bases, and the entrance reducers. I make nice large handles to hold them when I am packing them full of honey.

So, I argued with the claim's adjuster about the amount he told me he was going to give me. Mostly because I've lost that income for the next two years. Granted it's not a huge amount, but every little bit helps when you are a farmer! He told me that I am lucky that I was even getting a check. "They could have easily denied me," He said. They were not on my insurance policy, so they claimed them as "personal property". The adjuster said that the hives should not even be considered personal property. They feel that "personal property hives" refers to one or two hives in the back yard, not 60 hives out in the field.

Long story made short... Insure your hives! Make sure they are on the policy and that your agent knows what they are worth. Also, plan for a fire! It's not a matter of "if", but "when". I never dreamed that I would have a huge wild fire burn across my property. I have sure had my eyes opened though!

May everyone have a successful year!

Ryan Weston
Arbon, ID

BEEKEEPING IN SWITZERLAND

I was in the French-speaking part of Switzerland staying with family at a relative's vacation home in Ollon, Canton of Vaud, for a couple of weeks over the summer and took some pictures of hives next to the railroad tracks and some photos of honey bees on some beautiful flowers which I could not identify.

The round ball composite bluish-purple flowers were on the roadside in Ollon as were the tall spikes of bluish-purple flowers. I suspect the tall spikes of flowers may be some type of Russian Sage...but am unsure.

I traveled to Zermatt for a day trip (on Saturday, July 24, 2010...the day after the fateful derailment of the Glacier Express between Zermatt & St. Moritz which ended in 1 death and 42 injured individuals...apparently the driver was going too fast around a curve...a really rare occurrence with the famous reliable service of the Swiss Rail system). Unfortunately, the Matterhorn was shrouded in clouds during my visit, but I photographed honey bees foraging on the beautiful bluish-purple thistle-like spiky blooms (Russian sage).

Hive in Switzerland

Honey bee on purple flowers that I think are Russian sage.

My cousin, Simone Roth & her father, Beal, told me when I saw the same flowers blooming in a charming historic mountain village "Grimentz" in Canton "Valais" that these flowers only turn the beautiful bluish-purple color when they are grown above 1200 meters above sea level...and that the blooms are green when grown at lower elevations.

Christopher J. Stalder
Orange Blossom Beekeepers Association
www.orangeblossombeekeepers.org

Honey bee on blue globe thistle in Switzerland.

BAD QUEEN EXCLUDERS

This summer I had a queen get above the queen excluder. In carefully inspecting the old excluder, I found there were 2 wires that had broken welds, which allowed the queen room to move up. Later, in inspecting some new excluders purchased from a company, I found about half had either bad welds or improperly spaced wires. The company associate agreed to take them back, and reimburse my return shipping. I told her that I would mark the bad wires so they could see where they were defective. Then, I got an email stating:

"Since we have verifed that the queen excluders are not defective and you have defaced them by marking them with black marker, we will not be crediting the shipping back to us."

I called and said that since I had told the agent I would be marking them, I didn't feel it was fair to not keep their word on reimbursing my shipping cost. Then I did some research and found the proper spacing should be .163" (4.1 mm.) between wires, and recommended that they measure them before they declare them okay. This didn't get me anywhere.

You may have also been delayed in taking honey off due to brood in a a honey super. Pupal cocoons may also make the comb more likely to be damaged by wax moths.

I suggest beekeepers and suppliers check their metal-bound excluders for accuracy. Could it be that excluders are now made in China and that their technology is not up to our standards?

Happy Beekeeping,
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WHAT ARE THESE BEES DOING?

Attached are pics of some unusual behavior we had in beehives I help manage at the Sibley Quarry Yard. There was one hive that had these small, consistently sized sticks (we thought they were white pine needles at first) that the bees apparently carried up into the hive and stuck through the frames. The sticks went all the way through about two frames and were in every super at the same location (same corner of the super).

It seemed to be some kind of "ladder" between the frames. The sticks were all the same length and diameter, but we saw that there was some kind of rodent nest of the same material near the cement blocks under the hive, so the rodent must have determined the size of the sticks.

It seems that the sticks where placed at the same time or after the foundation was drawn as there was no damage to the foundation or capped cells (the damage you see was from us pulling out the frame).

It does not seem that a rodent had been up in the supers as everything around the sticks was completely drawn, mostly capped and clean. The sticks were all placed on a slight angle to fit through the center of a cell on both sides and into the center of the cell in the next frame.

Has anyone seen this behavior before - and does anyone have any idea what the bees are trying to accomplish?

Judy Durfy

Photos showing sticks in frames, one uncapped and the other capped over.

BEWARE OF THE BEE CLUB KILLERS

We who live in the South have seen the headlines screaming in the papers and on our local newscasts: "Beware the Killer Bees, Beware the Killer Bees!!!"

Newscasters and newsprint publishers like sensationalism and get as much coverage as they can to boost their ratings and sell their product. They will search out anyone who has been stung by a bee and try to tie it into the Africanized Bees, referred to as "AHB" by most folks in the bee world and called "Killer Bees" by the public. Sometimes they report AHB stings in areas where there are no AHB. You can go on any search engine and type in, "AHB locations in US," and you will find maps, charts and lots of information on the AHB.

Are they dangerous? Of course, they are just as dangerous as any stinging insect is dangerous if you have a bad encounter with them. The problem with AHB is that they are more aggressive than the European honey bees or *Apis mellifera*. They don't just chase you away from their nest or hive, but continue to aggressively chase you for a half mile or more.

The AHB have caused some long-time beekeepers to leave the business due to the extra cost of insurance, extra gear needed to work AHB, and of course the cost of hiring people dedicated enough to put up with the extra work needed to make a living with AHB. Since AHB swarm more than the European bees that beekeepers have been keeping for years, it takes much more time and effort to work them, but it can be done and is being done in parts of the world where the AHB have taken over the area.

They are a problem that can be dealt with, but we have a bigger problem facing beekeepers around the world and it may happen in your local area as well, even if you are not in an area where the AHB are located.

What I am referring to are the folks who are not into beekeeping for the right reasons. They seem so eager to get into beekeeping, coming to the meetings of your local bee club, asking a million questions and appearing to be willing to become a great asset to the club.

The problem arises usually after a year or two when they get to the point that they now "know everything" and want to be the person in charge. I call these folks "Bee Killers". They are dangerous and need to be watched for.

Did they put in their time learning under a mentor and working with the bees for years out in the rain, heat, cold, and taking the thousands of stings that happen when a forklift flips over or a truck gets into an accident and the millions of bees are aggravated and in a stinging mood? Have they ever gotten their veil caught on something and had it pulled off just as the bees attacked? Ouch! Have they lost entire outyards to vandals, fire or diseases like foulbrood? Or worse, did they lose hives and equipment to the thieves that are becoming more prevalent now that the price of honey is going up and the demand for pollination goes higher?

Many old-time beekeepers will not join a bee club because of all the problems they have faced over the years with these Bee Killers. I stopped attending meetings myself back in the 1980's because of this very thing. Now after retiring, I am trying to do my part to help our bees and other pollinators by starting new bee clubs and mentoring new beekeepers.

Beekeepers are a kind lot and welcome with open arms anyone who likes honey, wants to learn the correct ways of keeping bees, or just wants to help save the bees from all the harmful chemicals and bee pests in the world today. But who wants to attend a meeting where one side is antagonistic to the others?

State and even national bee organizations need to stress the importance that all organizations should strive to be efficiently run and have some type of support system in place to help the local bee clubs. Many folks ask why they should join a state or national organization: "Why spend money on an organization that is just building up their mailing list so they can ask you for more money constantly?"

A good club should strive for 100% participation.

If you want to be a beekeeper, you should stop and ask yourself the following questions:

- Am I trying to learn all I can about bees and the proper way to keep them?
- Am I supporting the club leaders and offering my time and talents to make the club better?
- Am I willing to make changes in the way I keep my bees if someone shows me a better way?
- Am I willing to support someone even if I disagree with what they are doing until a better solution comes along?
- Am I willing to step up and do what is best

Figure 1. The storage facility before the storm

Figure 2. Storage facility after the storm

for the club?

- Am I willing to ask questions if I don't understand what is being said, instead of just complaining about how the "clique" only cares about itself?

We have folks who hate commercial beekeepers. One told me she hates them because they adulterate their honey, use chemicals that are not good for humans to eat, and keep the small beekeepers down so that they can't make any money. When asked for proof, you get the same answer: "Well, that's what I heard." That is a Bee Killer attitude.

Think about what you are saying. Have you ever been a commercial beekeeper with the unbelievable costs and problems that go with it? If you haven't been there, give it a rest and be thankful for the ones who spend so much time away from family and friends to make sure we have honey in the stores, not to mention all the other products they provide.

What about the commercial beekeepers who won't help the small beekeeper? I have heard commercial beekeepers complain that "hobbyists" (I hate that word) are ruining beekeeping because they don't know what they are doing and they are helping to spread bee diseases, etc.

Wait a minute. Did you start with the 1000 hives you have, or did you work your way up by increasing each year? Did an old timer help you learn what you know now, or did someone loan you the money to buy the equipment you have? Did someone help you along? Don't be a Bee Killer by discouraging the new beekeeper who may replace you some day.

Chappie McChesney
Alachua, FL

TORNADO STRIKES BEE EQUIPMENT FACILITY AT THE OHIO STATE UNIVERSITY

On September 16, 2010, a tornado struck the Ohio Agricultural Research and Development Center (OARDC), which is the agricultural research campus of The Ohio State University at Wooster, Ohio. In addition to the OSU facility, many private homes were damaged, but there were no deaths and few injuries. However, damage to the Center was extensive and the loss of facilities, equipment, and research projects was significant. The storm directly struck the OSU honey bee equipment storage and maintenance facility. The building, a classic structure built in the 1920's, and all the holdings were declared to be a 100% loss. The destroyed bee hive paraphernalia represents the accumulation of about 80 years of bee hive and related equipment acquisition. The modern equipment, over time, can be replaced, but much of the old and novel equipment is gone forever. Also lost were the archival holdings of the Rothenbuhler Bee Lab. Original data and cataloged publications were either blown away or rain/mud-soaked.

So much as possible, equipment and devices were salvaged but most pieces bear marks of the storm. Several large extractors were broken beyond use. Several remaining extractors are seriously dented, but could possibly be made to run again. A Maxant Series 500 thirty-frame extractor was simply blown away and has never been found but a Maxant Vertical extractor survived but with damage. The wind force was great enough to tip full honey drums (600+ pounds) onto their sides. The drums leaked attracting large numbers of honey bees and yellowjackets to torment cleanup workers. The storage cabinet that held the lab's supplies of bee repellents was crushed so the strong odor of "Bee Go" saturated the area. A day later a 2" rain saturated the chaotic scene and added thick mud to the mix.

As time passed, the triage was performed on remaining holdings and the building along with destroyed equipment has been hauled away. So much as possible, the remaining equipment will be stored in two semi-trailers. Everywhere, parts are missing or are damaged. The marks of this storm will linger for many years and the blank space left in the history of OSU's honey bee program will be permanent. But bee life will go on at the Wooster campus. Only the field lab and storage facility were destroyed. The primary bee lab structure, located about .2 Mile away, was undamaged as was about 50 supered bee colonies in a nearby apiary.

Donations for our recovery fund are absolutely welcomed. We can be contacted at **Beelab@osu.edu** or at (330)263-3684. Our web page (**http://www.honeybeelab.com**) also lists a site for contributing to the program's recovery. Photos are posted on the Lab's Facebook page (**http://www.facebook.com/beelab**). Obviously, all expressions of concern and support are deeply appreciated.

Dr James E. Tew
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Department of Entomology
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MULTIFLORA ROSE PROVIDES ONLY POLLEN IN HIS AREA

I recently read in your Northeast area reports that multiflora rose (*Rosa multiflora*) produces honey. Well, we have lots of it here in southeast New Hampshire, but it is only a pollen source (see also Ramsey's book). It produces lots of orange-brown pollen, and the pellets are large, as no nectar is carried, and only small weight gains are made during its bloom. Some days this year, the trays were so full that pollen was scooped off the top of the tray on removal, and trays would not go back in all the way due to pollen between tray and front wall of the trap! I collected a 5 gallon bucket full from 48 traps on several days this season, some of them on staghorn sumac (*Rhus typhina*), which is a more golden pollen. It was one of the best years for pollen collection.

Best wishes,

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Conference Location:

The San Luis Resort
5222 Seawall Boulevard
Galveston Island, TX 77551
www.sanluisresort.com

The San Luis Resort consists of the Galveston Island Convention Center (where the tradeshow and all meetings will be held), the Hilton, the San Luis Resort and the Holiday Inn. Room rates range from $89 – $99 depending on which hotel you select.

2010 Registration Rates

Category	Advanced	On-Site
Single Person (Member)	$275.00	$325.00
Single Person (Non-Member)	$325.00	$375.00
Family (Member)	$375.00	$425.00
Family (Non-Member)	$425.00	$475.00
One-Day/One Person (Member)	$175.00	$225.00
One-Day/One Person (Non-Member)	$225.00	$275.00
One-Day/Family (Member)	$275.00	$325.00
One-Day/Family (Non-Member)	$325.00	$375.00

Non-member rates include a one-year membership to either ABF or AHPA.

Tentative Schedule: (subject to change)

Tuesday, January 4:

Morning/Afternoon:	Board and Committee Meetings
Evening:	Welcome Reception
	(complimentary to all registered attendees)

Wednesday, January 5:

Morning:	Opening General Session
Noon:	Tradeshow Opens
Afternoon:	Shared Interest Group Meetings
	Honey Show Judging
Evening:	Honey Queen Reception & Quiz Bowl

Thursday, January 6:

Morning:	Ladies Auxiliary Breakfast/Meeting
All Day:	General Session
	Serious Sideliner Symposium
	American Bee Research Conference
	Tradeshow
Evening:	"Murder by Honey" Dinner Show (optional)

Friday, January 7:

All Day:	General Session
	Serious Sideliner Symposium
	American Bee Research Conference
	Tradeshow
	Business Seminar
Evening:	AHPA Annual Banquet

Saturday, January 8:

Morning:	Interactive Workshops
	Tradeshow
Afternoon:	Business Meetings
Evening:	ABF/CHC Annual Banquet

Sunday, January 9:

Mid-Morning:	"The Hive" Beekeepers Social (optional)

For additional information and to register for the conference, please visit www.nabeekeepingconference.com

HONEY BEE IMPORTS FROM AUSTRALIA MAY BE BANNED

According to Wayne Wheeling and Colin Stewart at USDA's Animal and Plant Health Inspection Service (APHIS), a recommendation has been made to ban further imports of Australian Honey Bees. The decision is being made in light of continuing and increasing discoveries of *Apis cerana* Asian honey bees in Australia. Those finds have steadily increased and now number 214 finds since 2007, according to Wheeling.

Mr. Wheeling cautioned that at this point the border closing to Australian honey bees in only a recommendation, and that a final ruling has not been announced. When asked about continued imports from New Zealand and Canada, he said no change in their status would be made and that imports of honey bees would continue from those two countries.

A formal announcement of the ban will be printed in a future issue of the *Federal Register* if a final ruling is made to go forward with the ban, according to Wheeling.

A MORE CONCISE EXPLANATION OF CCD-IRIDESCENT VIRUS AND NOSEMA CERANAE

New technology finds pathogens that may reconcile contradictory claims on Colony Collapse Disorder

by JAMES FISCHER

(james.fischer@gmail.com) for "The American Bee Journal" (http://www.americanbeejournal.com) ***(Embargoed by the journal PLoS ONE until 10/06/2010 5pm EDT)***

A multi-institutional team of researchers sifted through the ever-growing zoo of new invasive, exotic pathogens of bees, and consistently found the same two disease organisms in beehives suffering from Colony Collapse Disorder (CCD) in samples collected from 2006 to 2009.

They discovered a new virus never seen before in North America, and found a well-known invasive variant of the intestinal bee disease Nosema. The overlooked virus may explain why prior studies presented mutually contradictory findings. This new evidence could create a basis for consensus among research teams who to date, lacked common ground in their conclusions.

Their paper appeared Oct. 6, 2010 in the journal *PLoS ONE* (http://dx.plos.org/10.1371/journal.pone.0013181)

The paper reports on a multi-year study of Colony Collapse Disorder. Researchers used new technology and techniques to detect and unambiguously identify every pathogen in collapsing bee hives, rather than the smaller subset of possible pathogens detectable via other means.

An Invertebrate Iridescent Virus ("IIV") , newly-found in North America, in combination with *Nosema ceranae*, which arrived from overseas less recently, was found in "*Virtually all of the bees from CCD colonies*" sampled from widely dispersed USA hives from 2006 through 2009.

IIV was not found in bees from packages imported from Australia nor in bees from an isolated non-migratory commercial bee operation in Montana, both sites confirmed free of CCD-like symptoms.

Additionally, the researchers "*observed the progression of CCD in a collapsing colony... taking bee samples... over a three month period, ending when only a queen and four workers remained.*"

Further still, some bees were inoculated with *Nosema ceranae*, while other bees were inoculated with the "IIV-6" strain of the IIV virus. Their mortality was then compared to bees inoculated with both pathogens, and a control group given a placebo. The results "*strongly suggest that the combination of N. ceranae and IIV is associated with increased bee mortality.*"

Yet even further, the effort discovered two additional invasive exotic bee viruses never before detected in North America, but determined that they were not involved in CCD. The viruses found are "Varroa Destructor-1 Virus" and "Kakugo Virus", both native to Asia.

Dr. Jerry Bromenshenk of U Montana outlined the next steps, "*We have a proposal pending to isolate, characterize, and then inoculate bees with the specific iridescent virus that occurs in USA bees. This is a critical step, since the virus does not appear to be any of the world's known iridescent viruses. Once we have the actual virus, we can complete the inoculation trials that are needed to test whether we've truly found the cause of CCD.*"

Proteomics – A Brief Summary

The technology used in this study seems ideal for addressing the ever-growing list of pathogens carried across oceans by the globalization of trade. It can detect disease pathogens that need not be identical to any known pathogen. This describes the needs of beekeepers clearly, given the number of invasives that came to plague honey bees in the USA since the early 1980s.

"Mass Spectrometry-Based Proteomics" (MSP) starts with about 60 bees tossed in a blender, and mixed until homogenous, then filtered. Cells are chemically burst, and proteins are isolated from the mix and "digested", breaking them down to peptides. The resulting peptides are run through a device called a "Liquid Chromatograph" to separate them by density, which allows their structure and sequence to be determined by another set of devices, "Tandem Mass Spectrometers".

Each peptide sequence is then compared to the NIH National Center for Biotechnology (NCBI) database of peptide sequences. The database used is a collection of the peptides unique to specific organisms. This means that each match of a peptide sequence is a unique match to a single organism. Any peptide used in more than one organism would not be in the database.

Dr. Charles Wick of the US Army Edgewood Chemical Biological Center explained the level of certainty with which the virus was detected in colonies showing CCD symptoms: "*IIV has 18,900 unique peptides... When we detect a few of these, say 50-100, we have enough evidence for an unambiguous identification.*"

But how did they make what Dr. Wick called an "*unambiguous identification*" of a virus that was said by Dr. Bromenshenk to not be "*any of the world's known iridescent viruses"?* How can anyone find what's never even been detected or identified before? The answer is that the unknown organism will match the closest organism in the database, which narrows things down to at least the "family" or "genus" level, if not "species". So, even without having sequenced the specific strain of IIV of interest, enough peptides matched the IIV strain in the database to confirm that what was found was a strain of IIV.

As an example of the wide net cast by this technique, Nosema was not well-represented in the NCBI database, so there was some ambiguity in the identification of the Nosema via proteomics alone, matching only the genus Nosema. The species and strain was confirmed as *Nosema ceranae* using Polymerase Chain Reaction (PCR) techniques.

The Claims In Spain Can Mainly Be Explained

Research led by Mariano Higes of the Bee Pathology Laboratory, Centro Apícola Regional in Marchamalo, Spain has repeatedly pointed to *Nosema ceranae* as the sole proximate cause of rapid colony collapse. This seemed unlikely to researchers in the USA and elsewhere, as Nosema has not appeared to be as virulent outside of Spain. But this new work provides an explanation that could support the Higes work with nothing more than the addition of the newly-detected IIV.

As in previous US studies, no one in Spain would have had reason to suspect that a DNA virus like IIV would be involved, as the bulk of bee viruses are RNA viruses. So they've yet to look for IIV in Spain, and they have not had the wider net of MSP to find what was not being sought. The good news is that Dr. Higes has historical samples

frozen. Dr. Jerry Bromenshenk reports that the Higes team is willing to engage in a joint effort to screen the Spanish samples using MSP.

Does This Explain CCD In The USA?

The samples analyzed in this study showed a wide range of pathogens, including Nosema, Invertebrate Iridescent Virus ("IIV"), Black Queen Cell Virus, Acute Bee Paralysis Virus, Israeli Acute Paralysis Virus, Deformed Wing Virus, Sac Brood Virus, Kashmir Bee Virus, Varroa Destructor-1 Virus, and Kakugo Virus. None of the suspect pathogens named by other research efforts were missed, two new and novel pathogens were found, and the use of MSP implies that no pathogens were overlooked. Even a new, unknown, and unnamed pathogen would have resulted in a partial peptide match to some other living thing.

So, while the counts or mix of pathogens might have been skewed by an insufficient number of samples, or collecting samples from an insufficient number of operations, it is difficult to imagine that there are additional pathogens yet to be found that could be implicated in CCD.

Insecurity About Biosecurity

Since the 1980s, "Globalization" has increasingly consisted of shipments of goods from Asian ports to Western shores. This research connects the dots by consistently finding specific bee pathogens native to Asia, unknown to USA beekeepers in the early 1980s, but that have since become far too familiar:

"We know that in the Asian honey bee, Apis ceranae, a combination of parasites and pathogens co-exist, including: (1) Nosema ceranae, (2) an iridescent virus, (3) parasitic and predacious mites, and (4) two other RNA-type viruses, Kashmir bee virus and a Sacbrood virus. We have had both Kashmir bee virus and Nosema ceranae in North America going back a decade or more. We need to see how similar the CCD strain of iridescent virus is to the IIV-24 strain from Apis ceranae. It is possible that US bees acquired IIV from the Apis ceranae along with Nosema ceranae and Kashmir bee virus."

While unsubstantiated "fringe" explanations for CCD abound, ranging from cell phones to pesticides to GMO crops, the common factor is that pathogens previously found only in Asia have spread to countries lacking effective biosecurity, such as the USA, but not to countries with more robust approaches to biosecurity, such as New Zealand. The research team suggests "*Standard quarantine practices such as testing of imported bees before they are added to colonies, and disinfection of equipment would likely help.*"

Practical Implications For Beekeepers

The team has two suggestions of interest to beekeepers:

1)"*Most IIVs replicate at about 21 C (70 F) and do not replicate above 30-32 C (86 – 89 F). Higher temperatures may suppress the virus by halting replication, whereas cool weather and damp conditions may speed up replication of both IIV and Nosema. Many instances of CCD have occurred following extended periods of cool, damp weather. Several beekeepers have reported to us that they have more problems with bees in areas with frequent fog or in hill areas where the weather is cooler. Placing bees in warm, sunny locations appears to help.*"

2)"*Varroa may act as a vector for the dispersal of IIV among bee colonies. Varroa is known to increase damage caused by other viruses, and beekeepers who fail to control varroa levels are likely to sustain high colony losses.*"

This may not sound like much, but it is a vast improvement over the usual vague platitudes we've been handed over and over about "maintaining strong colonies" and "minimizing stress". It also ups the ante in the age-old debate among beekeepers over placing hives in sun versus placing hives in shade.

"Iridovirus and Microsporidian Linked to Honey Bee Colony Decline"

Jerry J. Bromenshenk, Colin B. Henderson, Charles H. Wick, Michael F. Stanford, Alan W. Zulich, Rabih E. Jabbour, Samir V. Deshpande, Patrick E. McCubbin, Robert A. Seccomb, Phillip M. Welch, Trevor Williams, David R. Firth, Evan Skowronski, Margaret M. Lehmann, Shan L. Bilimoria, Joanna Gress, Kevin W. Wanner, Robert A. Cramer Jr.

(2010) *PLoS ONE* 5(10): e13181. doi:10.1371/journal.pone.0013181

Jim Fischer keeps bees in Manhattan, Brooklyn, and the Bronx, and hopes to raise queens in Queens. He teaches the free 16-week full-semester urban beekeeping class in New York's Central Park for the 846-member non-profit NYC Beekeeping Group (http://meetup.com/nyc-beekeeping and helps run the Gotham City Honey Co-Op (http://GothamCityBees.com).

HONEY LAUNDERER SENTENCED

September 13, 2010

Chinese National Sentenced for Scheme to Defraud United States Over Honey Imports False Paperwork Used to Hide Chinese Origin of Honey; One Shipment Tainted with Banned Chemical

UNITED STATES ATTORNEY'S OFFICE

Western District of Washington

BOA ZHONG ZHANG, a citizen of China, was sentenced Sept. 13, 2010 in U.S. District Court in Seattle to time served, about 17 months in prison, for Conspiracy to Enter Goods in the United States through False Statements and to Smuggle Goods into the United States, and Introduction of Adulterated Food Into Interstate Commerce. ZHANG is a 20-year employee of Bee Products Company in China, who was arrested May 6, 2009, in Los Angeles while traveling in the United States. U.S. District Judge James L. Robart noted that ZHANG will likely be deported, and so will face additional time in immigration detention.

"Knowingly misrepresenting the contents of an imported product can have significant repercussions and potentially put unsuspecting members of the public at risk," said Leigh Winchell, Special Agent in Charge of ICE's Homeland Security Investigations. "ICE will continue to investigate this type of import violation to help protect the health and safety of Americans."

According to the statement of facts in the August 2009, plea agreement, in 2005, the President of Changge Jixiang Bee Products Limited asked ZHANG to set up a transhipment scheme in the Philippines so that Chinese honey could be shipped through the Philippines to the United States to avoid the tariffs placed on Chinese honey. On behalf of Changge, ZHANG hired a company in the Subic Bay Freeport Zone, to tranship the Chinese honey to the United States. Chinese honey was unloaded at the warehouse, and re-labeled as a "Product of the Philippines." In April 2005, ZHANG oversaw the first shipment to the United States of falsely labeled honey. Later that summer, ZHANG met with co-defendant Chung Po Liu, of Bellevue, Washington. Liu owned two companies involved in honey imports and sales. At Liu's request, ZHANG arranged for twenty-one shipments of the falsely labeled honey valued at $1.6 million, through both the Philippines, and a similar scheme established in Thailand. Since the honey was labeled as Philippine or Thai honey, Liu avoided paying an anti-dumping tariff imposed on Chinese honey of approximately $2.9 million. One of the shipments which arrived in January 2008, was contaminated with ciprofloxacin, which is an antibiotic that is not permitted to be in the food supply.

ZHANG and Liu were indicted by the grand jury on June 4, 2009. Liu pleaded guilty last month and is scheduled to be sentenced on November 29, 2010.

Since 2001, anti-dumping duties have been applied to all honey imports from China. Antidumping duties are additional duties used to offset the effects of unfair trade practices that give imports an unfair advantage over competing U.S. goods. The duty on Chinese honey was 183% from 2001 to 2007, and has been 221% since 2007.

The case is being investigated by U.S. Immigration and Customs Enforcement (ICE) and the Food and Drug Administration Office of Criminal Investigations. The case is being prosecuted by Assistant United States Attorneys Norman Barbosa, and Special Assistant United States Attorney John Odell. Mr. Odell is an attorney with U.S. Immigration and Customs Enforcement, specially designated to handle customs cases in federal court.

TRUE SOURCE HONEY APPLAUDS RECENT EFFORTS TO SHUT DOWN ILLEGAL HONEY PRACTICES

WASHINGTON, DC September 2, 2010 – The True Source Honey Initiative applauds actions taken yesterday by U.S. Immigration and Customs Enforcement (ICE) and the Department of Justice (DOJ) to pursue leads in stemming the tide of illegally imported honey.

Yesterday's indictment is the largest in a string of federal actions in the past two years directed at stopping illegal trade in honey. The 44-count indictment means the defendants are facing up to 20 years in prison, $250,000 fines on each count, and multi-million dollar reimbursements for the unpaid antidumping duties.

"This is the kind of pressure we need to correct the serious problem of illegally traded honey, which is threatening the continued viability of the U.S. honey sector," said True Source Honey spokeswoman Jill Clark of Dutch Gold Honey, Lancaster, Penn.

The DOJ indicted 11 German and Chinese individuals and six corporations on federal charges for allegedly participating in an international conspiracy to illegally import Chinese honey. Federal law officials said the defendants allegedly imported more than $40 million of Chinese honey that was mislabeled to avoid nearly $80 million in antidumping duties, and included honey that was adulterated with antibiotics not approved for use in honey production.

In addition, an importer who was charged in May 2009 of illegally importing honey to the United States – including a shipment tainted with antibiotics – has pleaded guilty to related charges in U.S. District Court at Seattle. Chung Po Liu submitted false paperwork claiming that the honey had been produced in Thailand or the Philippines and thereby avoided high import fees on Chinese honey. One of the shipments included honey tainted with an antibiotic banned in U.S. food.

In addition to applauding the actions of the DOJ and ICE, the True Source Honey Initiative recognizes Sen. Charles Schumer (D-NY) and Sen. Amy Klobuchar (D-MN) for their recent efforts calling for strengthened enforcement laws to combat Chinese "honey laundering" and to ensure the purity of honey sold in the United States. Sen. Robert Casey (D-PA) and Sen. John Thune (R-SD) are also to be commended for their work in leading a group of 15 senators in an August 19 letter urging the Food and Drug Administration to finally move forward and establish a national standard of identity for honey within three months. Beginning last summer, Florida, California and Wisconsin adopted state honey standards, while a federal standard of identity proposal has languished at FDA with no action for 4-1/2 years.

Quality U.S. honey operations are also essential for the honey bees needed to pollinate dozens of fruit, vegetable and seed crops across the United States, said Clark. "One out of every three bites of food we take in this country relies on pollination from our honey bees."

Illegally sourced honey hurts the beekeeping and honey industry and puts an added strain on honey bee producers, already struggling with colony collapse disorder. In addition, illegally imported honey includes food safety and quality implications as honey is often adulterated, containing antibiotics, added syrups and sweetener extenders. With millions more pounds of circumvented honey entering the U.S. market in 2010, this illegal practice threatens a vital segment of U.S. agriculture.

The True Source Honey Initiative estimates that the illegal sale of honey in circumvention of U.S. trade laws cost the United States up to $200 million in uncollected duties in 2008 and 2009 combined.

"We thank the federal executive branch officials and Senators for their continued, important work for this critical sector of U.S. agriculture," said Clark.

The True Source HoneyTM Initiative is an effort by a number of honey companies and importers to call attention to the problem of illegally sourced honey; to encourage action to protect consumers and customers from these practices; and to highlight and support legal, transparent and ethical sourcing. The initiative seeks to help maintain the reputation of honey as a high-quality, highly valued food and further sustain the U.S. honey sector. For more information, visit www.TrueSourceHoney.com and follow us on Twitter at http://twitter.com/TrueSourceHoney and Facebook at http://www.facebook.com/pages/True-Source-Honey/142598785755162?ref=search

COMMERCIAL TRAP FOR WASPS, HORNETS AND YELLOWJACKETS "BAITED" WITH USDA TECHNOLOGY

Safe for Use Around Honey Bees

Forget the ants marching one by one--yellowjackets are the real party-crashers when it comes to spoiling picnics, outdoor barbecues and other summer fun where cold beverages and meat are present.

Fortunately, a new trap is available that lures these stinging, sugar-sipping pests to their doom, thanks to attractants developed by U.S. Department of Agriculture (USDA) scientists and commercialized by Sterling International, Inc., of Spokane, Wash. The scientists work for USDA's chief intramural scientific research agency, the Agricultural Research Service (ARS).

Sold commercially as the RESCUE! W-H-Y Trap (Wasps, Hornets and Yellowjackets), the technology is the successful outcome of a cooperative research and development agreement involving Sterling and the ARS Yakima Agricultural Research Laboratory in Wapato, Wash.

In studies there, research leader Peter Landolt isolated two key compounds from fermented molasses to produce an attractant blend that lures not only yellowjackets, but also paper wasps and hornets. ARS holds patents on the attractant and has licensed it to Sterling.

The blend Landolt developed and tested in collaboration with Sterling President Rod Schneidmiller and R&D Director Qing-He Zhang attracts 12 yellowjacket species, multiple paper wasp species (including *Polistes dominulus* from Europe) and two kinds of hornets, making it the most comprehensive lure yet.

Sterling's W-H-Y trap is unique in its design, with two compartments. The bottom is baited with an attractant that primarily lures western and southern yellowjackets. The top uses a different attractant blend to lure other yellowjacket species, bald-faced hornets, European hornets and paper wasps.

Once inside, the pests die by drowning or dehydration, depending on the compartment. Beneficial insects including honey bees are not attracted to the traps. W-H-Y traps are available to consumers at retail chains nationwide. (Courtesy ARS News Service)

EPA CONSIDERS EMERGENCY EXEMPTION FOR AMITRAZ VARROA STRIP USE IN SOUTH DAKOTA

From *Federal Register*/Vol. 75, No. 178/Wednesday, September 15, 2010

EPA has received a specific exemption request from the South Dakota Department of Agriculture to use the pesticide amitraz (CAS No. 330089– 61–1) to treat up to 250,000 colonies of beehives to control varroa mites. The applicant proposes a use of a pesticide which was voluntarily canceled under section 6(f) of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), and which poses a risk similar to the risk which was voluntarily canceled under section 6(f) of FIFRA. EPA is soliciting public comment before making the decision whether or not to grant the exemption. Comments were accepted until Sept. 30, 2010.

MAKING BEES LESS BUSY: SOCIAL ENVIRONMENT CHANGES INTERNAL CLOCK

Study suggests honey bees' circadian rhythms depend on contact with young

Washington, DC — Honey bees removed from their usual roles in the hive quickly and

drastically changed their biological rhythms, according to a study in the Sept. 15 issue of *The Journal of Neuroscience*. The changes were evident in both the bees' behavior and in their internal clocks. These findings indicate that social environment has a significant effect on the physiology and behavior of animals. In people, disturbances to the biological clock are known to cause problems for shift workers and new parents and for contributing to mood disorders.

Circadian rhythm, the body's "internal clock," regulates daily functions. A few "clock genes" control many actions, including the time of sleeping, eating and drinking, temperature regulation, and hormone fluctuations. However, exactly how that clock is affected by — and affects — social interactions with other animals is unknown.

Senior author Guy Bloch, PhD, and his colleagues from The Hebrew University of Jerusalem, Israel, chose to study bees in part because of their complex social environment. One role in bee society is the "nurse": bees that are busy at all times caring for larvae. This continuous activity is different from other bees and animals, whose levels rise and fall throughout the day.

Bloch and his team thought that changing the nurse bees' social environment might alter their activity levels, so they separated them from their larvae. The researchers found that the bees' cellular rhythms and behavior completely changed, matching a more typical circadian cycle.

"Our findings show that circadian rhythms of honey bees are altered by signals from the brood that are transferred by close or direct contact," Bloch said. "This flexibility in the bees' clock is striking, given that humans and most other animals studied cannot sustain long periods of around-the-clock activity without deterioration in performance and an increase in disease."

The results suggest that the bees' internal clocks were shaped by certain social cues. Jürgen Tautz, PhD, of the Julius-Maximilians Universität Würzburg in Germany, an expert in honey bee biology who was unaffiliated with the study, said it is a wonderful example of the tightly regulated interactions between genes and behavior in a bee colony. "The presence or absence of larvae switched the genes 'on' or 'off,' which guaranteed the adaptive behavior of the bees," Tautz said.

Because bees and mammals' circadian clocks are similarly organized, the question is whether the clocks of other animals also strongly depend on their social environments. The next step is to find just how social exchanges influence gene expressions. Further research into this question may have implications for individuals who suffer from disturbances in their behavioral, sleeping, and waking cycles. Research into how these rhythms may be altered and even stabilized might identify new treatment options.

The research was supported by the Israeli Science Foundation, the Israel-U.S. Binational Science Foundation, and the German Israel Foundation.

UC DAVIS PROFESSOR NORMAN GARY APPEARS ON HISTORY CHANNEL AS "HUMAN BEE HIVE"

by Kathy Keatley Garvey
UC-Davis Dept. of Entomology

DAVIS, CA.--When honey bee expert Norman Gary "suits up," don't expect a standard-issued bee suit.

It's not an "ordinary" bee suit. And what he does is not "ordinary."

Norman Gary, a retired University of California, Davis entomology professor, wears his bees—thousands of them.

And that suits him just fine. To him, bees are not only a science (study of apiculture), but an adventure.

Gary, 76, who retired in 1994 from UC Davis after a 32-year academic career, appeared Thursday, Sept. 16 on a History Channel show wearing 75,000 bees. The show was part of Stan Lee's "Super Humans."

Host-presenter Daniel Browning Smith has billed him as "the human bee hive" and explored bee behavior and the science behind the bees.

A crew from England filmed Gary in mid-May at the Harry H. Laidlaw Jr. Honey Bee Research Facility, at Rick Schubert's Bee Happy Apiaries in Vacaville-Winters and then in a UC Davis open field where the 75,000 bees clustered his entire body.

"That's about 20 pounds, depending upon how much honey or sugar syrup they have consumed," Gary said. "A hungry bee weighs approximately 90 mg and within a minute of active ingestion she can increase her weight to 150 mgs!"

Norman Gary knows bees. And he knows their behavior. As a beekeeper, he's kept bees for 62 years and as a researcher, he's studied them for more than three decades. He's published more 100 peer-reviewed scientific papers and four book chapters.

But he is also a bee wrangler. He trains bees to perform action scenes in movies, television shows and commercials. His credits over the last 35 years include 18 films, including "Fried Green Tomatoes"; more than 70 television shows, including the Johnny Carson and Jay Leno shows; six commercials, and hundreds of live Thriller Bee Shows in the Western states.

Gary estimates he has performed the bee cluster stunt at least 500 times over the past 35 years. He remembers 54 performances at the California State Fair alone.

The History Channel episode may be his last professionally staged bee-cluster stunt, he said. However, he will continue to serve as a bee consultant to video producers and has just written a beginning beekeeping book, "The Honey Bee Hobbyist," to be published in early December by Bow Tie Press.

"Bees are trainable, if you ask them to perform behaviors that are in their natural behavioral repertoire," Gary said.

For the shoot, Gary borrowed New World Carniolan bees from Schubert, whose bee stock originated with bee breeder-geneticist Susan Cobey of the Laidlaw facility. "Bees are not inclined to sting if they are well fed—happy and content—and are 'under the influence' of powerful synthetic queen bee odors—pheromones—which tend to pacify them," Gary said.

Bees are attracted to pheromones and they cluster on drops of pheromones he places on himself. While at UC Davis, he formulated a pheromone solution that is very effective in controlling bee behavior.

"Bees wrangled by this procedure have no inclination to sting," he said. "Stinging behavior occurs naturally near the hive in defense of the entire colony not for the individual bee, because it dies within hours after stinging. Using this approach I have had as many as a million bees clustered on six people simultaneously "

Gary once trained bees to fly into his mouth to collect food from a small sponge saturated with his patented artificial nectar. He holds the Guinness World record (109 bees inside his closed mouth for 10 seconds) for the stunt.

"Most people fear bees," Gary acknowledged. "They think bees 'want' to sting them. Wrong! They sting only when the nest or colony is attacked or disturbed or when they are trapped in a physical situation where they are crushed."

Sometimes, with the heavy weight of the bees on his body, he'll receive one or two stings per cluster stunt. Sometimes none.

Gary, who began hobby beekeeping at age 15 in Florida, went on to earn a doctorate in

Norman Gary, retired apiculturist/ professor of entomology at UC Davis, is surrounded by bees during the History Channel shoot in mid-May. He appeared on a History Channel show on Sept. 16, 2010. (Photo by Kathy Keatley Garvey. UC Davis Dept. of Entomology)

apiculture at Cornell University in 1959. During his career, he has worn many hats, including hobby beekeeper, commercial beekeeper, deputy apiary inspector in New York, honey bee research scientist and entomology professor, and adult beekeeping education teacher, and author.

Known internationally for his bee research, Gary was the first to document reproductive behavior of honey bees on film and the first to discover queen bee sex attractant pheromones. He invented a magnetic retrieval capture/recapture system for studying the foraging activities of bees, documenting the distribution and flight range in the field. His other studies revolved around honey bee pollination of agricultural crops, stinging and defensive behavior, and the effects of pesticides on foraging activities, among dozens of others.

Today his life centers around music and bees. He has played music professionally for more than 50 years and for nine years has led a Dixieland band, appropriately known as the Beez Kneez Jazz Band, recording two CDs. He has performed more than 30 years in the Sacramento Jazz Jubilee, the world's largest jazz festival.

His instruments include the "B-flat clarinet," which he plays when he's covered with bees.

"I'm still very active in bees and music," Gary said. "It's a good life."

GENIUS AWARD TO U OF MN BEE LAB'S MARLA SPIVAK

Marla Spivak, University of Minnesota Bee Researcher Is a Recipient Out of the blue—$500,000—No strings

CHICAGO (September 28, 2010) Marla Spivak, who leads the University of Minnesota's Bee Lab, has been named a 2010 MacArthur Fellow – known as the Genius Awards. Dr. Spivak is working to protect one of the world's most important pollinators—the honey bee—from decimation by disease.

The John D. and Catherine T. MacArthur Foundation today named 23 new MacArthur Fellows for 2010. Working across a broad spectrum of endeavors, the Fellows include a stone carver, a quantum astrophysicist, a jazz pianist, a high school physics teacher, a marine biologist, a theater director, an American historian, a fiction writer, an economist, and a computer security scientist. All were selected for their creativity, originality, and potential to make important contributions in the future.

The recipients just learned, through a phone call out of the blue from the Foundation, that they will each receive $500,000 in "no strings attached" support over the next five years. MacArthur Fellowships come without stipulations and reporting requirements and offer Fellows unprecedented freedom and opportunity to reflect, create, and explore. The unusual level of independence afforded to Fellows underscores the spirit of freedom intrinsic to creative endeavors. The work of MacArthur Fellows knows neither boundaries nor the constraints of age, place, and endeavor.

"This group of Fellows, along with the more than 800 who have come before, reflects the tremendous breadth of creativity among us," said MacArthur President Robert Gallucci. "They are explorers and risk takers, contributing to their fields and to society in innovative, impactful ways. They provide us all with inspiration and hope for the future."

"There is something palpable about these new MacArthur Fellows, about their character as explorers and pioneers at the cutting edge. These are women and men improving, protecting, and making our world a better place for us all. This program was designed for such people—designed to provide an extra measure of freedom, visibility, and opportunity," said Daniel J. Socolow, director of the MacArthur Fellows Program.

The selection process begins with formal nominations. Hundreds of anonymous nominators assist the Foundation in identifying people to be considered for a MacArthur Fellowship. Nominations are accepted only from invited nominators, a list that is constantly renewed throughout the year. They are chosen from many fields and challenged to identify people who demonstrate exceptional creativity and promise. A Selection Committee of roughly a dozen members, who also serve anonymously, meets regularly to review files, narrow the list, and make final recommendations to the Foundation's Board of Directors. The number of Fellows selected each year is not fixed; typically, it varies between 20 and 25.

The MacArthur Foundation supports creative people and effective institutions committed to building a more just, verdant, and peaceful world. In addition to selecting the MacArthur Fellows, the Foundation works to defend human rights, advance global conservation and security, make cities better places, and understand how technology is affecting children and society. More information is at www.macfound.org.

FEARS OF A DECLINE IN BEE POLLINATION CONFIRMED

May be due to climate change

TORONTO, ON - Widespread reports of a decline in the population of bees and other flower-visiting animals have aroused fear and speculation that pollination is also likely on the decline. A recent University of Toronto study provides the first long-term evidence of a downward trend in pollination, while also pointing to climate change as a possible contributor.

"Bee numbers may have declined at our research site, but we suspect that a climate-driven mismatch between the times when flowers open and when bees emerge from hibernation is a more important factor," says James Thomson, a scientist with U of T's Department of Ecology and Evolutionary Biology.

A queen bumble bee (*Bombus bifarius*) collects nectar from a flower of the glacier lily (Erythronium grandiflorum) at a research site in Irwin, Colo.

Thomson's 17-year examination of the wild lily in the Rocky Mountains of Colorado is one of the longest-term studies of pollination ever done. It reveals a progressive decline in pollination over the years, with particularly noteworthy pollination deficits early in the season. The study will be published in Philosophical Transactions of the Royal Society B: Biological Sciences on September 6.

Three times each year, Thomson compared the fruiting rate of unmanipulated flowers to that of flowers that are supplementally pollinated by hand. "Early in the year, when bumble bee queens are still hibernating, the fruiting rates are especially low," he says. "This is sobering because it suggests that pollination is vulnerable even in a relatively pristine environment that is free of pesticides and human disturbance but still subject to climate change."

Thomson began his long-term studies in the late 1980s after purchasing a remote plot of land and building a log cabin in the middle of a meadow full of glacier lilies. His work has been supported by the U.S. National Science Foundation and the Natural Sciences and Engineering Research Council of Canada. (University of Toronto)

BEE CONSERVATION—EVIDENCE FOR THE EFFECTS OF INTERVENTIONS

This book brings together scientific evidence and experience relevant to the practical conservation of wild bees. The authors worked with an international group of bee experts and conservationists to develop a global list of interventions that could benefit wild bees. They range from protecting natural habitat to controlling disease in commercial bumblebee colonies.

For each intervention, the book summarizes studies captured by the Conservation Evidence project (www.conseravtionevidence.com), where that intervention has been tested and its effects on bees quantified. The result

is a thorough guide to what is known, or not known, about the effectiveness of bee conservation actions throughout the world.

Bee Conservation is the first is a series of synopses that will cover different species groups and habitats, gradually building into a comprehensive summary of evidence on the effets of conservation interventions for all biodiversity throughout the world. By making evidence accessible in this way, we hope to enable a change in the practice of conservation, so it can become more evidence-based. We also aim to highlight where there are gaps in knowledge.

Evidence from all around the world is included. If there appears to be a bias towards evidence from northern European or North American temperate environments, this reflects a current bias in the published research that is available to us. Conservation interventions are grouped primarily according to the relevant direct threats, as defined in the International Union for the Conservation of Nature (IUCN)'s Unified Classification of Direct Threats (www.iucnredlist.org/technical-documents/classification-schemes).

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HONEYS & CHEESES SERVED UP AS KEY TO A HEALTHIER FOOD FUTURE

Green Gourmet Gold Discovered in California—ORIGINAL BOOK on pairing two of nature's most consistent food treasures!

Gold has once again been discovered in northern California! Only this time the wealth and riches comes from an entirely different mine of earthly treasures. Today's hills are filled with pots of golden sweetness and savory flavor strands that nature itself has offered up as a resource for cashing in on a healthier food future.

This second gold rush has begun with the release of a new book called *Green Gold: Pairing Honeys & Cheeses*. The first book of its kind, Green Gold is really a treasure map that guides food gourmets and community empowerment entrepreneurs alike to an amazing array of secrets for building a better world.

The book is self-published by Allan Shore in partnership with Erick Martinez. It can be purchased at Shiroco's, Martinez's local fusion decor retail store or can be purchased online via http://VentureCharities.biz. The book sells for $49.99 (plus shipping). The book is hardcover and filled with colorful public domain artistry. A digital version can also be downloaded for $22.00.

"Few people realize that honeys and cheeses have been around for as long as humans have recorded their existence," notes primary author Allan Shore. "Fewer yet know that there is an incredible universe of honey and cheese flavors and that both have been tied to an amazing array of cultural, spiritual and economic advances in just about every successful civilization across time."

The book explores the many delectable secrets of these seemingly mundane foods, and starts an adventure in understanding why both foods offer real solutions to many of the challenges we face today.

TOGETHER FOR A SWEET FUTURE

Beekeeping Industry to Gather in Galveston in January

With only a few months to go, the "Together for a Sweet Future" 2011 North American Beekeeping Conference & Tradeshow agenda is taking shape. As you might have guessed by the title, the conference, Jan. 4-8, in Galveston, Texas, will bring together members of the American Beekeeping Federation (ABF), the American Honey Producers Association (AHPA) and the Canadian Honey Council (CHC) and promises to be the largest beekeeping event in the United States. And with an anticipated attendance of more than 1,200, this is sure to be the conference you won't want to miss – beekeepers at all levels and from all over North America and beyond will gather to share ideas and develop new contacts.

Multiple industry leaders have been invited to share their knowledge and practical experience during the conference and the response has been phenomenal. Industry experts will come together to provide up-to-date information on topics imperative to beekeepers at all levels. Here's just a sample of some of the topics that will be presented at the conference:

- **Development of Attractants and Repellents for Control of Honey Bee Pests** presented by Dr. Peter Teal, USDA-ARS, Gainesville, Florida
- **The UCD and WSU Stock Importation Project** presented by Dr. Susan Cobey, University of California
- **Dream Fields** presented by Dr. Jeff Pettis, USDA-ARS Beltsville Lab, Maryland
- **Research in Molecular Biology at the USDA Lab in Baton Rouge** presented by Dr. Lanie Bourgeois, USDA-ARS Baton Rouge Lab, Louisiana
- **Identifying the Origin, Nectar Types, Blending, and Transshipping of Honey** presented by Dr. Vaughn Bryant, Texas A&M University
- **The Importance of Honey Bees and Other Pollinators to US Agriculture: 1992-2008** presented by Dr. Nicholas Calderone, Cornell University
- **Honey Bee Pharmacology** presented by Dr. Marion Ellis, Professor, University of Nebraska, Lincoln
- **Impact of Nutritional Stress, Varroa and Nosema Acting Either Singly or Together on Honey Bee Strength and Survival** presented by Dr. Frank Eischen, USDA-ARS Weslaco Bee Lab, Texas

The conference will be held at the San Luis Resort, which consists of four properties: The Galveston Convention Center (where all meetings will be held); The Hilton; The San Luis Resort; and The Holiday Inn. We have secured rooms at all three hotels with rates ranging from $89.00 to $99.00 per night (plus tax).

The conference will begin on Tuesday evening with a complimentary welcome reception for all registered attendees. Wednesday morning will kick-off with the Opening General Session followed by Shared Interest Group meetings, and then finish in the evening with the traditional Honey Queen Reception. The 2011 American Honey Show will also take place on Wednesday.

The expanded tradeshow will open on

Wednesday afternoon and remain open during conference hours until noon on Saturday. Thursday and Friday will be dedicated to general sessions, as well as the always-popular and well-attended Serious Sideliner Symposium facilitated by Dr. Larry Connor of Wicwas Press and the ABRC conference. Interactive workshops will take place on Saturday morning. In addition, both the ABF and AHPA will host their annual banquets during the conference.

The conference will include many great opportunities for networking and socializing, including two optional activities. "Murder by Honey" will take place on Thursday evening and includes dinner and entertainment, provided by YOU. That's right, join us for a murder mystery dinner, where you and your fellow beekeepers will put on your acting caps and show just how talented you truly are. This is sure to be a great time for all who participate.

The second optional activity will follow the conference on Sunday and is just the place to unwind and socialize with your new friends. We've reserved the conference lounge at the San Luis Resort for lunch, networking and fun. So before you go home, stop by for a little last-minute mingling.

Additional information, including registration rates, guest room accommodations, the conference schedule, invited speakers, session topics and much more, can be found on the conference Web site at www.nabeekeepingconference.com. Be sure to check the Web site often as additional conference details will be posted as soon as they are made available. Register now and take advantage of the regular registration rates, which will be honored through Dec. 16, 2010.

NEW YORK

The Western New York Honey Producer's
November Potluck Dinner

Date and time: Wednesday, November 17, 2010 6:00 p.m.
Place: First Presbyterian Church
9 Paine Street, East Aurora, New York
Speaker: Dr. Larry Connor- Biology Driven Management
Note: Bring dish to pass, your own utensils, plates, and cups. Beverages provided.
Any questions: Call Fred Thompson at (716) 773-4945
Website: **www.wnyhpa.org**

NEW YORK

The Empire State Honey Producers Association will be holding our fall 2010 meeting on November 19th and 20th at the Comfort Inn and Suites, Syracuse, NY.

New this year will be a Saturday morning workshop for new beekeepers or those who may be interested in becoming a beekeeper. Please visit our website at www.ESHPA.org for additional information.

NEW YORK

Bee Sex in the City will be the topic of a talk given by Dr. Larry Connor for the New York City Beekeepers at 7 pm on December 7, 2010. This reviews the basic reproduction of bee colonies, the development and mating of queens, and their mating behavior. The meeting will be held at the Seafarers International, 123 East 15th Street, New York City. This is one block from Union Square. A question and answer period will follow the talk.

For further information: www.wicwas.com

CONNECTICUT

Fifth Southern New England Beekeepers Assembly November 20 features Medhat Nasr, Dave Miksa and Larry Connor

With a theme of PROACTIVE BEEKEEPING, the fifth SNEBA meeting will run from 8 am to 5 pm at the Unitarian Society of New Haven, located on Turnpike Road in Hamden, CT.

Speakers and topics are:

Medhat Nasr Ph.D., Alberta Provincial Apiarist, Alberta Canada. He will speak on: 1. Practical Integrated Pest Management for Honey Bee Varroa Mites. 2. Alberta Honey Bee Surveillance Program: Is it Colony Collapse Disorder? and 3. Use of Organic Acids in Mite Control: Principles and How to make them work.

David Miksa, Commercial Queen Producer, Groveland, Florida. He will speak on three aspects of queen rearing, selection and queen use: 1. "Why it Happens", 2) "Tools Needed" and 3) "How we do it". Miksa produces tens of thousands of queen cells for use throughout the United States.

Larry Connor, Ph.D. Owner, Wicwas Press and Author for *Bee Culture* and *American Bee Journal*. He will discuss: 1. Virgins and 48-hr cells, My experience in 2010, 2. Insanity Confirmed: Setting up a very small queen rearing and breeding program, and 3. Teaching beekeeping teachers.

Registration is $49 per person with a reduced fee of $39 for those registering by October 31. A box lunch will be an option at $10 per person. You may bring your own lunch.

Registration forms are available at the **SNEBA.COM** website—please check that site for updates. PayPal registrations are being accepted at the **WICWAS.COM** bookstore website.

CONNECTICUT

Backyard Beekeepers Association

November 30: Allan Hayes on his unusual beekeeping tools & gadgets

Allan Hayes will discuss his unusual beekeeping tools & gadgets. President of the Howard County Beekeepers Association & Certified Master Beekeeper, Hayes will share with us some of his really clever little utensils. Meetings are at 7:30 p.m. in the Norfield Congregational Church in the Community Room on Norfield Road in Weston, Connecticut. At 6:30 p.m. there is a NewBees meeting for beginning beekeepers and WannaBees youth group meeting.

Each month we have timely weekend hands-on inspection workshops, bee school, mentor program and more. All events are free and open to the public. Please check our website for the dates and locations or more information at www.backyardbeekeepers.com

2010 BYBA weekend workshops:
Saturday November 6: Beeswax Workshop: Ellen Zampino, Patty Pulliam & Marina Marchese

PENNSYLVANIA

Starting With Bees will be the topic of a talk given by Dr. Larry Connor at the Pennsylvania branch of Brushy Mountain bee supplies on Dec. 8, 2010. This will review key aspects of starting bee colonies, equipment needs, how to get bees, personal protection from stings, honey production, and more. A question and answer period will follow the talk.

For information on registration and fees contact Brushy Mountain at 570-568-0870. For further information: **www.wicwas.com**

NORTH CAROLINA

If you have not yet heard the exciting news, the Buncombe County Beekeepers Chapter of the NC State Beekeepers Association will be hosting a MUST attend beekeepers event Nov. 13, 2010. Check out **www.wncbees.org** to sign up for this event before it sells out. The cost is only $35 to attend a day with some of the foremost authorities on beekeeping in the world. You are in a unique position to take advantage of this event, so do not miss out on this opportunity.

The event will be held at the beautiful Folk Art Center, located near milepost 382 on the Blue Ridge Parkway in Asheville, NC. It lasts from 9:30 a.m. to 5:00 p.m. on Saturday Nov. 13th. The lineup includes FOUR highly sought-after speakers with cutting-edge experience and practical knowledge of things we all want to learn about honey bees: Dr. Marla Spivak; Dr. Jay Evans; Dr. Deborah Delaney and Dr. Jamie Ellis.

OHIO

The fall meeting of Ohio State Beekeepers Assoc. will be Nov. 6, 2010, 9:30 a.m. to 3:45 p.m. in the Bromfield Bldg. at the Ohio Department of Agriculture, Reynoldsburg, Ohio. Guest speaker will be Fred Rossman

of Rossman Apiaries in Georgia. Ohio legislators from the Ohio Honeybee Task Force will be present. Registration will open at 8:00 a.m. More info contact: John George **jkgeorge1@roadrunner.com**

ILLINOIS

The Illinois Beekeepers Association will have their fall annual convention Nov. 6, 2010 at the Dept. of Agriculture Building in Springfield, IL. Check their website for contact addresses: **www.isba.us**

IOWA

The Iowa Honey Producers will be holding their annual meeting November 5th and 6th at the Marshalltown Best Western Inn in Marshalltown, Iowa. Speakers will include Marla Spivak, University of Minnesota; Susan Cobey, University of California; and Dee Lusby of Arizona. For more information contact Pat Randol 515-210-7445 or email **Pat@RandolHoney.com**.

WISCONSIN

The WHPA's Fall Convention will be held Nov. 4-7, 2010 at the Holiday Inn, 4601 Calumet Ave., Manitowoc, WI. Early registration fees paid before 9/30/10 will be $40.00 for members and $15.00 for their spouses and children (12-18 years at home). Late registration fees for members will be $55.00 and $15.00 for their spouses and children (12-18 years at home). Rates are higher for non-members. Friday luncheon is $15.00 and Saturday banquet is $25.00

LOUISIANA

Louisiana Beekeepers Association (LBA) Annual Convention December 3 – 4, 2010

The Louisiana Beekeepers Association will hold their 49th annual convention on Friday, December 3rd and Saturday, December 4th at the Embassy Suites in Baton Rouge, Louisiana. Please join us for the latest research information from the USDA/ARS Honey Bee Breeding, Genetics & Physiology Lab. Beekeeping basics, pest management and many more topics will be discussed. A block of rooms will be held for the LBA at a special rate of $89.00 plus tax. Please call the hotel at 800.362.2779 to make your reservation. **Remember to mention the Louisiana Beekeepers Association to get the special rate. Please, make your reservations early, since the cut off date is November 25th.** A registration fee of $10.00 is required. There will be something for everyone from beginner to lifetime beekeeper, so please join us in Baton Rouge. For more information contact Alva Stuard at 225.261.2032, Sharon Hebert at 337.937.6722 or Jimmy Dunkley at 225.610.2628 or visit the web site at **www.labeekeepers.org**.

NEBRASKA

Nebraska Beekeepers will host guest speaker Kirk Webster on November 20. Additional speakers include Reed Johnson and UNL graduate students. For more information, visit nebraskabeekeepers.org or contact Todd Fiala at 402-783-0324 or **tf92300@windstream.net**.

IDAHO

The Idaho Honey Industry Association Convention will be held Dec. 2 and 3, 2010 in Boise, Idaho at the Red Lion Downtowner. To reserve rooms call (208) 344-7691 and be sure and tell them you are with the IHIA (bee guys). To register for the convention call Cindy at (208) 888-0988.

CALIFORNIA

The 121st annual convention of the California State Beekeepers will be held Nov. 16-18, 2010 at the Embassy Suites in San Luis Obispo, CA. Besides the informative speakers and the trade show, convention attendees will be able to visit such attractions as Hearst Castle, Cal Poly, Pismo Beach and the beautiful central Pacific coastline. Check our website **www.californiastatebeekeepers.com** for convention updates.

HAWAII

The Big Island Beekeepers Association is pleased to sponsor the 1st Hawaiian Natural Honey Challenge. This event will be held Tuesday, Nov. 9, 2010 at the Komahana Agricultural Research Station, 875 Komahana Street, Hilo, Hawaii. Entry forms may be downloaded from the Association website: http://bibahawaiibees.org. To compete, entry forms must be submitted by November 1. Contact Frankie Stapleton, P.O. Box 2094, Pahoa, HI 96778, (808) 965-8945 for more information.

NEW ZEALAND

National Beekeepers' Association Conference - Auckland 2011

Waipuna Hotel & Conference centre
Mt. Wellington, June 26-30, 2011

Sunday - New/Small Beekeepers' Seminar
Monday - Specialty Groups Meetings & Beekeeper of the year finals Honey competition
Tuesday - Seminar Day
Wednesday - Seminar Day
Thursday - AGM

Special Invite:
To all international beekeepers
Everyone Welcome!

Contact: Bob Russell, The Secretary, Auckland Branch, National Beekeepers' Association, 101 Kern Rd., R.D. 3, Drury 2579
Phone: 09 294 8656
Email: bob.russell@paradise.net.nz

UNITED STATES

The USDA Animal and Plant Health Inspection Service is recommending that Australian package bees be banned from entry into the United States due to the danger of accidentally importing the Asian honey bee *Apis cerana*. Over 200 swarms of the Asian honey bees have been found and destroyed by the Australian government authorities. Some beekeepers are predicting that this will put a real squeeze on the available supply of colonies for California almond pollination in 2011 since some 40,000 Australian packages of bees have been purchased per year for almond pollination over the last few years. According to Joe Traynor, Scientific Ag Company, Bakersfield, CA, "An additional 20,000 acres of almonds will require bees in 2011. This increase, coupled with the spot shortages of bees this year, has stabilized pollination prices." Mr. Traynor wrote this before the decision was made to ban Australian package bees. Other unknown factors could exacerbate this anticipated shortage if, for example, overwintering losses were unusually high this winter.

Estimating the total U.S. honey crop this year is difficult since crops have been so spotty in many parts of the United States, especially the Midwest. However, it is safe to say that the total production will definitely be better than last year's record poor year when the USDA estimated that the total honey production was only 145 million pounds. Honey production was better in the Dakotas and California and these three states alone usually account for over one-third of the total U.S. honey crop. Much of the East Central and West Central areas also had better honey crops, despite some real honey crop disasters caused by unrelenting rain showers.

One interesting note on varroa: A number of beekeepers have indicated lower varroa mite populations this season. They are hopeful that this will be one less obstacle that they will have to overcome in bringing their bees through the winter. Lack of stores is a big concern, however, in some locations and beekeepers have been feeding their bees in an effort to provide sufficient stores to overwinter.

Beekeepers continue to be optimistic about both the wholesale and retail honey markets. Honey demand and prices remain high. There continues to be a shortage of honey, especially the local varieties that many consumers have not be able to find over the last year or two.

NORTHEAST—Fall flows from goldenrod, aster and Japanese knotwood brought additional stores and surplus honey. As this was written in early October, beekeepers were just beginning to have freezing weather, which will bring the last flows of the season to a close. Heavy rains in September caused some problems for beekeepers trying to finish their beeyard work. Some beekeepers were feeding syrup and adding winter wraps in preparation for the long cold season.

Honey crops were generally better in the Northeast and beekeepers are happy to have honey for their customers. Last season a number of beekeepers did not remove any honey or very little. Local retail and wholesale demand for honey remains excellent, according to most of our reporters.

MIDEAST—This was a season of extremes and spotty honey crops. Some locations had great spring honey flows, while others reported disappointing flows due to erratic weather. Hot, dry weather hurt the season in some locations, while in other states torrential rains and flooding were a problem. Flooding in some parts of this area was especially acute in September and early October after constant downpours of rain flooded local rivers and streams.

The sourwood flow was better than last season for many beekeepers, but was still not rated as normal or good. As this was written, the last flows from goldenrod and aster were finishing. Some beekeepers had already begun feeding and will continue until colder weather puts colonies into winter clusters. Varroa mites seem to have been less of a problem this season, but small hive beetles caused headaches for beekeepers in parts of the Mideast.

Beekeepers have been busy bottling and selling their crop at the many roadside stands, farmers' markets and fall festivals. Demand is generally very good. Small packers are still looking for honey and are offering increased prices in order to rebuild their inventories.

SOUTHEAST—Colonies were finishing their last flows from Brazilian pepper, cabbage palm, sea myrtle, mangrove, goldenrod, aster and Spanish needles. Although final crops estimates from Florida were again down from normal, beekeepers in a number of other Southeastern states registered near normal or better than normal honey crops before hot, dry summer weather curtailed remaining spring or early summer flows. Beekeepers are finishing their last extracting for the season, but many had already sold the bulk of their earlier honey crop. Prices remain good in the neighborhood of $1.20 to $1.60 for most amber grades. Some orange and white gallberry honey is selling higher. Demand remains good at both the wholesale and retail levels.

Colonies are in fair to good condition going into winter. Many beekeepers had finished their mite treatments and colony movement to winter holding yards. Small hive beetle damage was a major problem for some beekeepers again this season. Migratory beekeepers had begun feeding colonies in preparation for making their long journey to California for almond pollination.

SOUTHWEST—Colonies were still working blossoms from the last of the wildflowers and cultivated crops. Sources mentioned included goldenrod, aster, smartweed, Spanish needles, irrigated cotton, soybeans and alfalfa. The weather during August and September was extremely hot and dry over much of the Southwest. Beekeepers were finishing the last of their extracting and bottling, as well as treating for mites and feeding where necessary. Migratory beekeepers are gearing up for their move to California for almond pollination.

Much of the crop has been sold. Sales remain brisk at both the wholesale and retail levels, especially for special local varieties of honey. Sales and prices are expected to remain strong through the end of the year. Many buyers are still rebuilding their inventories.

EAST CENTRAL—As we have indicated previously, honey crops have been very spotty in this area due to frequent rains beginning this spring and continuing until fall. Those lucky beekeepers who had their colonies strong and were on the edges of the heavy rains lucked out and produced average or good honey crops from clover, alfalfa and basswood. On the other hand, many beekeepers never received a break from the rainy weather. As a result, the little honey that has been produced was darker and higher in moisture. High moisture honey, as could be expected, is more of a problem this year, especially for the smaller beekeepers who do not have large heated holding tanks available to drive off excess moisture.

Some beekeepers in this region were dealt

U.S. HONEY, BEESWAX AND POLLEN PRICES FROM OUR REPORTERS

	North-east	Mid-east	South-east	South-west	East Central	West-Central	Inter-Mountain	West
Wholesale								
White lb. Bik.	$1.40-$2.20	$1.45-$2.00	$1.30-$1.70	$1.35-$1.70	$1.50-$2.00	$1.40-$1.75	$1.30-$1.60	$1.35-$1.60
Amber lb. Bik	$1.35-$1.60	$1.30-$1.75	$1.30-$1.50	$1.30-$1.60	$1.35-$1.75	$1.30-$1.60	$1.30-$1.50	$1.30-$1.50
1 lb. CS 24	$50.00-$80.00	$45.00-$82.00	$48.00-$90.00	$51.00-$85.00	$52.00-$75.00	$55.00-$81.00	$60.00-$95.00	$57.00-$92.00
2 lb. CS 12	$59.00-$80.00	$58.00-$72.00	$60.00 $68.00	$58.00-$73.00	$59.00-$79.00	$51.00-$78.00	$57.00-$76.00	$60.00-$77.00
5 lb. CS 6	$72.00-$88.00	$58.00-$87.00	$60.00-$76.00	$57.00-$75.00	$57.00-$86.00	$60.00 $84.00	$59.00-$85.00	$59.00-$88.00
Retail								
Jars 8 oz.	$1.50-$3.00	$1.40-$4.00	$1.25-$2.95	$1.20-$2.90	$1.50-$3.50	$1.40-$2.95	$1.30-$2.60	$1.25-$3.90
Squeeze Bear 12 oz.	$1.89-$3.50	$2.00-$4.00	$1.75-$3.75	$2.25-$4.00	$2.50-$3.95	$2.25-$4.10	$2.50-$3.85	$2.25-$4.25
Jars 1 lb.	$2.50-$5.50	$2.55-$5.25	$2.40-$4.75	$2.50-$5.00	$2.45-$5.25	$2.95-$5.25	$2.75-$5.25	$2.70-$5.95
Jars 2 lb.	$3.99-$6.75	$3.95-$7.00	$3.99-$5.49	$3.00-$6.25	$3.25-$8.00	$3.29-$6.50	$3.25-$6.25	$3.50 $6.50
Jars 1½lb. (Pint)	$4.50-$7.00	$4.25-$8.00	$3.50-$6.00	$3.58-$6.50	$3.25-$5.50	$3.50-$5.50	$3.75-$6.00	$4.75 $8.25
Jars 3 lb. (Quart)	$5.50-$9.75	$5.95-$14.00	$5.79-$10.00	$5.25-$9.25	$5.00-$11.50	$4.50-$10.00	$5.10-$9.75	$5.00-$12.50
Jars 4 lb.	$7.50-$12.00	$8.00-$15.00	$7.00-$10.75	$6.00-$12.70	$8.00-$14.00	$5.50-$13.50	$6.00-$14.50	$6.50-$16.00
Jars 5 lb.	$8.99-$19.00	$7.00-$19.50	$7.50-$17.50	$7.25-$18.00	$8.00-$21.00	$7.75-$18.00	$8.00-$19.25	$8.50-$22.00
Creamed 12 oz.	$2.50-$5.50	$2.50-$4.00	$2.49-$3.95	$2.25-$3.99	$2.50-$4.25	$1.99-$4.25	$1.75-$4.00	$2.25-$5.00
Comb 12 oz.	$3.00-$7.00	$3.50-$8.00	$2.25-$7.25	$2.50-$6.50	$2.50-$5.75	$2.50-$6.50	$2.50-$5.75	$2.75-$7.50
Round Plas. Comb	$4.00-$6.50	$3.25-$5.50	$3.50-$5.00	$3.00-$6.25	$3.25-$5.99	$3.00-$6.50	$3.25-$6.00	$3.50 $7.50
1 Gallon	$15.00-$25.00	$12.50-$26.50	$14.50-$25.00	$15.00 $25.00	$15.00-$30.00	$15.00-$27.00	$15.00-$30.00	$15.00-$30.00
60 lb.	$115.00-$145.00	$84.00-$125.00	$85.00-$120.00	$80.00-$130.00	$82.00-$140.00	$80.00-$135.00	$85.00-$130.00	$80.00-$130.00
Beeswax								
Light per lb.	$2.10-$3.50	$2.10 -$2.75	$2.10 -$3.00	$2.10 -$2.50	$2.10 -$2.50	$2.10 -$2.50	$2.10 -$2.50	$2.10 -$2.50
Dark per lb.	$1.95-$3.00	$1.95 -$2.35	$1.95 -$2.25	$1.95 -$2.25	$1.95 -$2.25	$1.95 -$2.25	$1.95 -$2.25	$1.95 -$2.25
Pollen								
Wholesale per lb.	$3.50-$6.50	$3.50-$8.00	$3.00-$6.00	$3.00 $5.00	$3.25-$6.00	$3.25-$6.00	$2.50-$6.00	$2.50-$5.50
Retail per lb.	$5.50-$15.00	$7.00-$15.00	$6.00-$15.00	$6.00-$10.00	$7.00-$15.00	$7.50 $15.50	$7.00-$12.00	$7.00-$15.00

The above prices are not meant to provide a realistic picture of prices in all states of the particular area. They are intended merely to show what a few beekeepers are receiving for their honey, beeswax and pollen and we realize prices may vary tremendously, even within individual states. The bulk prices for honey are stated per pound, delivered buyer's warehouse, containers exchanged or furnished by buyer, unless otherwise noted. Where prices are not shown, insufficient data were available.

HONEY MARKET FOR THE MONTH OF AUGUST 2010

In volumes of 10,000 pounds or greater unless otherwise stated

(From SEPTEMBER 2010 USDA National Honey Report)

Prices paid to beekeepers for extracted, unprocessed honey in major producing states by packers, handlers & other large users, cents per pound, f.o.b. or delivered nearby, containers exchanged or returned, prompt delivery & payment unless otherwise stated.

-Report includes both new and old crop honey-

(# Some in Small Lot — +Some delayed payments or previous commitment)

Arkansas - Soybean extra light amber $1.55
California - Orange white $1.60
Sage white $1.55 - $1.59
Dakotas - Alfalfa white $1.50 - $1.55
Canola white $1.47 - $1.55
Clover white $1.47 - $1.60
Wildflower extra light amber $1.58
Florida - Galberry extra light amber $1.55
Orange white $1.60
Orange extra light amber $1.60
Palmetto extra light amber $1.55
Palmetto light amber $1.25
Wildflower extra light amber $1.55
Wildflower light amber $1.50
Louisiana - Clover/Willow light amber $1.35
Tallow light amber $1.25 - $1.35
Wildflower extra light amber $1.45
Wildflower light amber $1.25 - $1.40
Maine - Blueberry extra light amber $1.65
Mississippi - Gallberry light amber $1.55
Wildflower extra light amber $1.45
Wildflower light amber $1.40
Minnesota - Clover white $1.55
Montana - Clover white $1.50 - $1.60
Texas - Tallow light amber $1.25

Prices paid to Canadian Beekeepers for unprocessed, bulk honey by packers and importers in U. S. currency, f.o.b. shipping point, containers included unless otherwise stated. Duty and crossing charges extra. Cents per pound.

Mixed Flowers white $1.59.

Prices paid to importers for bulk honey, duty paid, containers included, cents per pound, ex-dock or point of entry unless otherwise stated.

Argentina - Mixed Flowers white $1.47 - $1.55
Mixed Flowers extra light amber $1.45 - $1.58
Brazil - ORGANIC light amber $1.49 - $1.57
India - Mustard light amber $1.32 - $1.40

another blow when they checked brood chambers this early fall and often found them empty! In fact, some of these beekeepers were forced to give supers of honey back to their bees that they had hoped to extract. Others began intense feeding and hope to provide enough syrup for bees to overwinter. In some cases, good late goldenrod, aster and black-eyed Susan flows have helped provide stores for winter. Migratory beekeepers are feeding both syrup and pollen substitutes in preparation for almond pollination season in early 2011. Almond pollination demand and prices are expected to be good, so many commercial beekeepers plan on making the long trip to California again.

Due to another short crop in this area, honey remains in short supply and prices have increased at both the wholesale and retail levels. Price quotes from our reporters are varying from $1.50 to $1.75 for white honey and 10 to 20 cents per pound lower for amber grades. Some small-lots continue to sell as high as $2.00 per pound at the wholesale level. Many beekeepers also indicate a very receptive buying public, especially from those consumers wanting a locally produced honey variety.

WEST CENTRAL—Honey crops were better in South Dakota and parts of Minnesota, Iowa and Missouri. However, here again crops have been very spotty due to erratic weather. While parts of Iowa, Missouri and Minnesota had too much rain, parts of Kansas, Nebraska and Southwest Missouri were on the dry side. The beekeepers on the borders of these weather extremes were the lucky ones and some harvested record honey crops. Colony strength was another major factor. Those colonies that were strong coming into early spring clover and alfalfa flows made much better crops than those beekeepers who had weak colonies or had to make many divides in order to recoup their winter losses.

Freezing weather was quickly bringing the foraging season to a close, as colonies worked remaining goldenrod, aster, Spanish needles and black-eyed susans along highways and in vacant fields. Earlier, colonies were reported to be working alfalfa, buckwheat, sunflowers and knapweed. Beekeepers were feeding where stores were short, as well as finishing their mite and disease treat-

ments. Many colonies will be moved to California for further build-up in preparation for the almond pollination season. Demand and prices are expected to be strong in 2011 due a possible shortage of bees.

Honey demand and prices both remain strong. Many beekeepers have already sold much of their crop at the wholesale level at prices ranging from $1.50 to $1.75 for white and $1.40 to $1.65 for amber grades. Most packers are eager to rebuild their inventories, but some are still waiting until the total crop is known before they make many offers on new crop honey. Honey is also selling quite well at roadside markets, fairs and festivals. In rainy parts of this area, some beekeepers have had problems with high moisture honey.

INTERMOUNTAIN—At times erratic weather varying from too wet to too dry hampered honey flows from clover and alfalfa. However, a number of our reporters said their total honey crops would still be better than last season's extremely poor crops. Beekeepers were finishing extracting and bottling in preparation for the busy holiday season. Sales at the wholesale level are brisk and beekeepers also expect that holiday retail honey sales will be good. Much clover and alfalfa honey has already been sold at the wholesale level in the $1.55 to $1.70 range, with some varietals like sage selling higher.

Beekeepers were very busy preparing colonies for winter, which included finishing their feeding and medication plans, as well as wrapping colonies in preparation for the long winter. Some additional winter stores came from late alfalfa, rabbit brush and goldenrod. Migratory beekeepers will again move their colonies to California for build up and almond pollination in early 2011. California almond pollination demand is expected to be strong in 2011.

WEST—Honey crops are better than last year for the most part. In some locations weather hampered flows or bee development, but for the most part, the extra soil moisture was a benefit to honey flows in the West. Later flows have at times been hampered by cool weather, but the extra ground moisture prolonged wildflower flows, according to a number of our reporters. In Washington and Oregon bees were still working goldenrod, aster, knapweed, thistles, rabbit brush and other late plants.

Colony health reports are variable, depending on the location. Beekeepers in some parts of California said that colony populations were down and would need to be built back before almond pollination time. Other beekeepers in parts of the Northwest said that their bees were strong coming out of honey flows. For some reason, varroa populations were down, which is definitely a good sign.

The big news for California almond pollination is that some 40,000 Australian bee packages may not be available for almond pollination this season if the USDA Animal and Plant Health Inspection Service's proposed ban is signed into law. This is being done due to the finding of increasing numbers of the Asian *Apis cerana* honey bee swarms in Australia. Without these Australian package bees, there may be a shortage of bees for almond pollination, resulting in some last-minute panic negotiations by growers trying to lock in colonies for their crops.

The wholesale and retail honey markets remain strong on the West Coast and prices have increased for new crop honey.

ARGENTINA

As of the end of September, cold weather prevailed in Argentina. Drought conditions are again threatening a substantial part of the Argentine prairies, specifically the west of Buenos Aires, southern Cordoba and eastern La Pampa provinces. However, part of these areas still has good moisture conditions that will be sufficient until the end of spring. According to meteorologists, the La Niña weather pattern is predicted to hit the Southern Hemisphere again this year.

The beekeeper's major concern is how to stimulate brood rearing. However, finding suppliers able to provide large quantities of HFCS and granulated sugar has become a labor-intensive task. Government price controls have discouraged manufacturers from selling at below their cost of production. On the other hand, the largest manufacturer of brewers yeast for farm animals is not able to meet the needs of beekeepers. The impact of these nutritional deficits will be noticeable during the current spring.

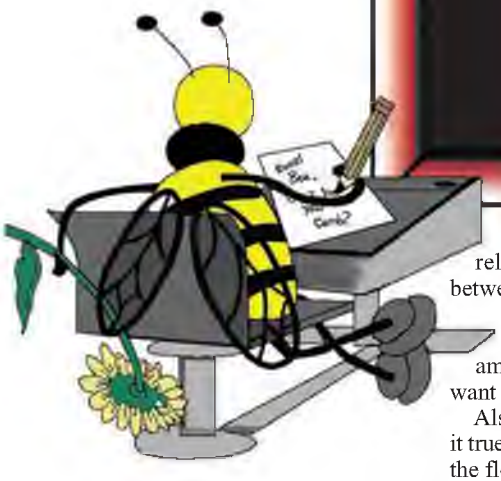
Honey exports during the period July-August 2010 were 8,391 metric tons (MT) and sold for US$25.37 million, equivalent to US$3,024 per MT. This volume is down 18% compared to July-August 2009 exports, but the price is 9.5 % higher this year. After comparing export volumes of the period January-August 2010 (43,980 MT) against January-August 2009 (47,388 MT), a 7.5% decrease in volume has been experienced during the current year. Argentine honey shipments abroad pay a 10% export tax collected by the government to contribute to the federal budget. So far, beekeepers have been charged over US$13.24 millions during 2010. At the same time, Argentine honey pays a 17.3% import tax upon arrival into the European Union. The competitiveness of local exports is jeopardized by these taxes.

During the period January-August of 2010, Germany imported 38% of Argentine honey, while the USA share has been 31%. The combined demand of these two large importers represents 69% of total Argentine exports. Interestingly, during the first eight months of 2009, the joint imports of these two countries again represented 69%. However, during 2008 Germany absorbed 48% of Argentine deliveries, while the USA had only imported 21% of the volume. So, the balance of imports between these two countries suffered a major shift due to intense competition from US buyers. On the other hand, Japan, which was a minor destination for local exports, jumped from a 2.68% share during 2009 to almost 6% this year, putting it in third place after Germany and the USA.

Some exporters have expressed their concern regarding the small number of transactions. They blame the current high price demanded by beekeepers and the pressure from Eastern European honey, making its way into traditional markets supplied by Argentina. Darker grades, including eucalyptus honey, are available, as well as white honey, but in much smaller volumes.

The Classroom
by Jerry Hayes

Please send your questions to Jerry Hayes
Email: gwhayes54@yahoo.com



From the "THAT'S INTERESTING DEPT"

I think we are all aware of the USDA Food Pyramid and the recommendations for serving sizes. So, this is kind of interesting. Mr. John Schall, president of American Farmland Trust, says, "For everyone in the United States to eat the minimum daily requirements of fruits and vegetables set by the USDA in 2005 dietary guidelines, an estimated 13 million more acres of farmland are needed." So, that means with the now higher USDA 2010 dietary guidelines of even more fruits and vegetables that even more land is needed if everyone eats the recommended daily allowance. That is a lot of land. How come we do not see more land in production for fruits and vegetables? Check the produce country of origin labels in the grocery store the next time you are there.

Q What Bees Eat and See

I have a question. When honey bees forage for pollen, is it true that they select pollen that is rich in nitrogen? How does the protein/nitrogen content of different plant species

relate to the bees' ability to discriminate between these pollens? I remember reading something about this several years ago, but I am unsure if it's correct. I am checking with you because I don't want to give false information.

Also, when bees navigate over flowers, is it true they see ultraviolet light reflecting off the flower and then use this cue as a way to determine which flowers to visit? I would like to share this information with some fellow beekeepers.

Travis

A

Protein contains a lot of nitrogen because it is part of protein. But, honey bees can't discriminate nitrogen (protein) in pollen well. Plus, honey bees do not eat pollen because they cannot digest the robust outer coat. Honey bees eat "bee bread" which is a fermented product, which releases the food material inside that has now been partially digested.

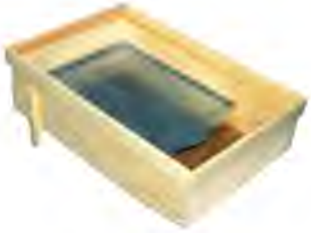
Honey bees are looking for nectar and pollen from entomophilous or insect-friendly flowers. This pollen is sticky and designed for insect transport. These flowers also provide their pollen with higher nutritional levels than wind-blown pollen. Wind-blown pollen has to be produced in extraordinary quantities because the chances of wind haphazardly taking it to the right flower parts are not good. So, not a lot of resources are packed into windblown pollen unlike insect-specific flowers, which do not have this problem. The bees' first choice is entomophilous pollen and if there is a lack of this, then they default to wind-blown pollens like bahia grass, corn or others. They collect not because they like it, but because it is a survival strategy.

Regarding your last second question, Google "honey bee see UV photos". There are lots of choices. Pretty cool.

Q Solar Wax Melter

Can Plexiglas be used instead of regular glass in a solar wax melter?

Thank you,
Joe Schultz



A

It depends. In some situations the temperatures that build up and are retained in a solar wax melter can melt the Plexiglas or warp it, and the heat certainly makes it discolor sooner. It is definitely more breakage-resistant than glass in some of the heavier grades. However, glass can take heat better. Everything is a trade off.

Q "The Classroom" Book

I was reading my September issue of the *American Bee Journal* and I saw a question about when you were going to write another book. I didn't even know that you had written one, which brings me to my question: How can I get a copy of your book? I would be interested in reading it.

Thank you for your time. I really enjoy your classroom section in the ABJ!

Mark Lawrence

A

Dadant & Sons sells the "Classroom" Book. You can buy it at www.dadant.com. Thanks for the compliment.

Q Apiguard

I find I have a box of Apiguard, which I so far have not used. My plan was to put it in after I took off my honey. I took off my

third super of honey in mid August. My plan was to let the rest of the honey go for winter bee use. I have one or two shallow supers above the brood. There was some brood in the honey supers as well when I took off "my" honey.

The Apiguard Instructions tell me to wait until after the honey flow before placing a tray of the product on the top of the brood frames, which will mean below the honey supers I have left for the bees to use. In the spring, I will try and get all the bees to move down into the lower two brood boxes. (I am often at odds as there may be some brood in the "honey" frames in the upper box. (I have often moved that box and placed it below the brood chambers.)

If the bees should not make it through the winter, I usually then harvest the leftover honey from the upper honey frames. My feeling is I should NOT bring in that honey due to possible contamination from the Apiguard. In which case, I will find a way to see that it gets used (below the brood frames) in some other of my hives. Does this seem correct?

1. Do I have to wait until late September before I can use the Apiguard, (after the honey flow)?
2. Is any of the honey remaining in the upper honey supers not to be taken (next spring) for human consumption?

Many thanks for ALL the help you give us in your Classroom.

Gordon Shaw
Concord, MA

A

Gordon, Apiguard is pure thymol (the herb thyme) and is very volatile. It vaporizes easily at hive temperatures and is not very fat (beeswax) or water (nectar/honey) soluble. It is a good product to use for safer Varroa control. Use it now (Sept). I wouldn't wait.

Use any of the honey at anytime for your own use. It will be fine.

Q Small Hive Beetle

Jerry, as you know, if it *ain't* one thing, it's another. I am a suburban backyard hobbyist a little north of Chicago. Over the winter both of my colonies died, but that isn't the subject of this letter. I cleaned up the dead-outs, putting in new foundation in a number of the frames, and ordered packages. The packages came promptly, I installed them promptly, the queens were accepted and began laying well. The population built up quickly from the syrup I fed and from the local black locust, basswood, and clover flows, to the point that to my pleasant surprise the second deep in each colony was wall-to-wall workers, brood, and stores by the first week in July, so I supered them. They took advantage of the tail end of this year's prolonged clover flow, and one colony gave me one shallow of honey, and the other gave me two. I took the shallows off on 8/13/10, so I could start Apiguard treatment.

A few days later, when I started to extract, I saw a dozen or so small hive beetles on the cappings—I had never noticed any on the combs themselves when I put on the Apiguard or on the shallow frames at any time.

Questions:

1. I understand that package bees can carry Varroa or tracheal mites on or in their bodies, but can a package somehow bring in SHB? They aren't really a parasite. There was no comb in the boxes they came in, or maybe just a few cells. I am almost positive I have the only honey bees, kept or feral, in town. Am I missing something?
2. Meanwhile, the colonies seem fine. Half the advice I read tells me to inspect the hives for SHB, and the other advice tells me not to do any manipulations for fear of upsetting the small hive beetle imprisonments the bees have set up. When I took out the first Apiguard tray to put on the second, I looked over the tops of the frames and didn't see any beetles. Also, the hives are situated in good sun, on concrete slabs surrounded by hard dry clay that I can hardly poke a spade into. Should I leave well enough alone, or is there more I should be doing?
3. In each shallow I always put one cut comb frame. After I cut the squares and put them in boxes, I know to freeze them for a day to kill the wax moth eggs—I'm sadder but wiser on that. Will this same freezing kill beetle eggs/larvae if present?

Jerry, I thank you for taking the time to read all this. You are very much appreciated.

Allen Cosnow
Glencoe, Illinois

A

Allen, thanks for the questions. Let me give them a try.

1. Package bees can carry everything. Enjoy!

2. Small hive beetles (SHB) are attracted to colonies that are under stress from other pests, predators and diseases or you. SHB can pick up the alarm pheromone that colonies produce up to 10 miles away. Weak colonies cannot police their home adequately, so SHB have an opening. Strong colonies can, so SHB adults are harassed and are reluctant to make these colonies SHB nurseries. Colonies in full sun and situated as you have them are less attractive to SHB females. You are doing well. However, do not stop looking in your colonies for fear of SHB multiplying. There is a balance, but the key is colonies that have a bee on every inch of comb.

3. I am surprised you can get away with only 1 day of freezing for wax moth egg control. You are making me nervous. Three to 5 days for wax moth and SHB would be better in my opinion.

Q Magnetoreception

Several dedicated and qualified researchers have studied "magnetoreception" as a means for the homing ability of honey bees. Their published reports in scientific journals are peer reviewed and informative. It dismays and mystifies us why honey bee experts, including yourself, do not discuss magnetoreception.

I have read numerous reviews on CCD and not one article discusses magnetoreception and its possible involvement in CCD. I have read every *Am. Bee J.* for the last 20 years, and not once was magnetoreception mentioned. **WHY!!!** To us it makes perfect sense! We have our own perspective and theory on CCD and its cause. The attached newsletter addresses this issue. Your comments would be appreciated.

Tom Ferrari
Alissa Cobb

P.S. I (TF) have studied pollen biology at Cornell University for 10 years as a post doc; received a PhD in Horticulture at MSU; received an MSc from NC State Univ.; have AAS and BSC degrees in Forestry; and have 25 years of independent research in the practice of supplemental pollination and use of honey bees in that cultural practice. Our company (Pollen Bank) pollinated over 5,000 acres of fruit and nut crops in 2010, making us the 5th largest "farmer" in California involved in those crop categories. Thus, with my **35** years experience in pollen biology and knowledge of honey bee behavior, I feel I have significant credentials and am qualified to comment on the CCD disorder.

A

Tom & Alissa, thank you for the information. I have seen it before and it is certainly interesting. How it may relate to honey bees is still open for conjecture. Honey bees are influenced and attuned to their environment and over the millennia of time they have existed in their current form, having proven highly adaptable through climate change, solar flares, asteroids, volcanoes and man. With the global nature of the world's commerce that includes people, pets, livestock and their pathogens in all forms, honey bees are suffering health challenges just as we are. Whether "magnetoreception" is part of the complex of honey bee health issues is open to debate.

According to Randy Oliver, "The hypothesis that this could be the cause of CCD simply doesn't appear to meet Koch's postulates. If paramagnetic flux were the problem, then all colonies should be suffering! And any colonies near high high-voltage lines would be unable to orient. Since neither of these predictions are observed, I have to discount the hypothesis that flux is the cause of CCD."

Q Essential Oils

I have read several articles about essential oils for bee care and would like to know your opinion of them. Do they work or not? Thank you and the editor for the tons of help this *Classroom* has provided.

Merl

A

As formulated in labeled products such as Apiguard or Api Life Var, some essential oils work great. Beekeepers who use kitchen counter chemistry and try to re-invent the wheel so to speak, generally are disappointed and not effective as they had hoped or do damage to their colonies. I vote for Apiguard and Api Life Var.

Q PEACH JUICE HONEY OR SOMETHING?

My mentor, Estel Shultis, gave me your email address because I have a weird bee situation that he thought you could help with. I have an interesting situation with the two hives in my backyard. I extracted the three honey supers that I had on the hives a few weeks ago and put them back on the hives just in case a new nectar flow showed up late in the year. The bees had made some progress filling the supers back up and then, when I went out to check on them on Saturday, all of the honey supers had been refilled almost overnight. After some investigation, I noticed that my bees were collecting on the peaches in my giant peach tree and drinking juice directly out of the peaches and storing that juice in the hive.

Do you know if the peach juice will turn into honey? Will it be good for human consumption or should I give it to the bees next spring as feed?

Travis Taullie
Denver, Co

A

This is not unusual at all Travis if there is high sugar content in damaged fruit/fruit juices available. Honey bees are efficient and resourceful food gatherers. Why fly a mile to a flower offering nectar that is 10% sugar when you can go to a damaged fruit having 18% sugar that is 50 yards away? Honey bees are not so concerned about the source as they are the food/energy value trade-offs.

Other insects, primarily wasps and hornets, have biting or piercing mouthparts unlike honey bees. These other insects are looking for a high energy food as well and they can reach the fruit juice by biting or chewing a hole in a peach, apple, grapes, plums, etc., to get at the high sugar juice. Honey bees are opportunists and use the same holes the wasps made and now you have peach juice concentrate, not peach honey. I have no idea if it will keep its freshness or start fermenting in the comb. Let me know how it turns out. If you check the moisture level with a refractometer and it is above 18%, then you will know that there is a potential problem with fermentation.

One warning—if you don't consume it, don't feed it back to the bees since it might cause bee dysentery, especially during winter flightless periods.

Q Api Life Var

Our bee club members are having a robust discussion about whether or not we can leave our honey supers on if we are treating with Api Life Var (ALV). The ALV web site seems to indicate this is ok. If the honey supers are full of honey that we are either 1) leaving on for the bees for the winter or 2) using for personal use and not selling - would it be okay to treat while the supers are on the hive?

Part of the concern is that for some of us, there has not been a big build-up of honey - and if we treat and remove the supers, we lose at least three weeks of honey production. Some of us have mite loads that warrant treatment now - and some bee books, "experts" etc., are recommending treatment now to give the hives several months to build up the colony with winter mite-free bees.

I see this question has a lot of components - we sure appreciate your wise and insightful responses. Yours is the first read for me whenever the *Bee Journal* arrives in our mailbox. Much appreciated

Sally
Vermont

A

Api Life Var is composed of aromatic essential oils. As these oils release, vaporize, and off gas their aromatic components, they damage and kill varroa. These vapors are rather unstable and do not strongly link to beeswax or nectar/honey. But, at times of high heat and humidity, nectar and uncapped honey can pick up minute quantities of these chemical vapors and produce off flavors and aromas not associated with natural honey. These small taste and odor changes probably won't be hazardous to you or the bees. Many times in the extraction process these chemical odors are released just from the honey being exposed to the air. They evaporate easily and quickly, especially when warm.

If I have a vote, I would treat now, Sally, and don't worry about it, especially with your #1 & #2 plans (not sold to the public). Do it. A few thymol fumes are much more benign than the residue potentially left over from treatment with some of the harsher chemicals or acaricides.

Q Fermenting in the Comb

I enjoy reading your Classroom feature very much. I have a group of seven hives in close proximity to a small town in central Illinois. One of the hives has capped frames of honey that bubble when the caps are removed. The honey has a sour taste and has some appearance of being fermented. None of the caps have "blown off" though even after a few weeks of observation, which I would have expected if it were fermenting. Have they just stumbled upon an already fermented fruit or hummingbird feeder and are making honey from it? If so, why does the capped honey have bubbles in it? I hope you can help shed some light as to what might be going on.

Greg Rosenquist

A

It is fermenting in the comb. Whether it is from a hummingbird feeder or is caused by a really wet summer and constant high humidity, it really doesn't matter. Generally honey bees can reduce the moisture of honey down to 18% or so, which is the lower limit for naturally occurring yeast to grow and multiply. Sometimes the bees do their best, but cannot reduce the honey moisture level down low enough. Then, these yeasts start doing what yeasts do and create carbon dioxide (CO_2) and alcohol as they eat the sugar and reproduce.

If you have had higher rainfall and subsequent higher humidity, coupled with higher temperatures, the bees may not have been able to lower the honey's moisture down to an acceptable level so that it will not readily ferment. This material should be removed from the combs because it is not edible for the bees or you. One possibility would be to use a garden hose and wash it out of the combs. Of course, you could also extract it and then dispose of it. Heating the honey to 145 degrees F. for 30 minutes will stop further fermentation by killing the yeast, but this process will darken the honey considerably and it will probably still have a sour taste.

If it were easy everybody would be doing it. Hang in there!

Q Old Queens Crystallized Honey and Varroa Control

First of all, thank you for your time, effort and wisdom in addressing our many questions. Where you find all the time to do this, and all your other pursuits, can only be obtained through divine intervention.

I have a couple questions please:

1) What is the likelihood a good queen will still be good a third year. This was going to be her last year before requeening next year, but she still supported my best hive in mite resistance, good early build-up, overwintering, calm nature and produced 200 lbs. honey. I hate the thought of replacing her.
2) Why does my honey crystallize so quickly? My first harvest was 4 weeks ago, and it is already showing signs. I think it is a good sign of high sugar content, but it's not as attractive or easy to use for the customer without warming it up.
3) As I try to stay chemical-free in my treatments, and use powdered sugar for mites as often as I inspect, how often is too much during the honey flow? One article I read recommends as much as every four days. I've also heard to leave them alone during the flow.

I always wish I could spend more time with my girls, but as a hobby beekeeper with a full-time job, it's all I can do to do regular inspections and routine care for them.

Thanks again for your down-to-earth insights to our many beekeeping questions. It is a tremendous help to all of us in this fascinating, yet challenging beekeeping world.

David Henrikson
Walnut, Illinois

A

David, thank you for the Classroom compliment. We are all in this together.

First of all, about your super queen…I think I know about a 1,000 beekeepers who would be glad to take her off your hands and provide you with the money for a new, young queen☺

#1. Years ago in a beekeeping industry far, far away, queens did last successfully for three years. Reports such as these are few and far between anymore. Are you sure she is the original queen? Did you have her marked and/or clipped so you really know? If not, she could have quietly and smoothly been replaced several times over during the course of three years. If she is the original queen, you are very lucky and whatever queen she is, if she is still doing what a queen is supposed to do and you are happy, then keep her.

#2. Most honey crystallizes, some more quickly than others based on the ratios of certain sugars not being balanced and room storage temperature. If the sugars are not balanced, then they try to balance themselves and some sugar precipitates out and forms crystals. Why fight it? It is a sign of a natural product. You can put it to your advantage and make creamy smooth honey spread. It is called the Dyce process. Google it on the Internet.

#3. Applying powdered sugar every three or four days could be a pain, but it works for removing exposed (phoretic) varroa mites. Your goal of as few chemical treatments as necessary is terrific. Perhaps this is why you have a queen that may be three years old. Why don't you back off to powdered sugar once a week, so you can apply it on the weekends and survey by taking mite samples to see if it is doing what you want.

The goal here David is to enjoy this. If you don't enjoy it, then it is a job and you will cycle out of beekeeping and start collecting stamps, antique fire hydrants or something else. Sounds like you are doing well. Keep it up!

Q Virgins Spraying?

I had a swarm call yesterday on a driveway. I was able to find the virgin queen quickly as it was a small cluster of bees. As I picked her up, she sprayed. What was that? It scared me at first, as if I had held her too tightly and smashed her. It was clear liquid and she did it only once. Within a minute, my hand was covered in workers. Pheromone or waste? Have you ever heard of spraying as a queen defense?

Bo

A

Man, you are one of the very select few to ever be up close and personal to this event! Virgin queens will spray (a pheromone) when they are in combat with another virgin. It is highly attractive to workers as you found out. The supposition is that when virgins are in mortal combat, if they can spray their opponent, the workers cling to the one sprayed and she is in effect immobilized. Now the queen that sprayed her can more easily get to her rival and sting her. Life finds away to spread certain genetics around. Very cool that you actually were the recipient!

The Traveling Beekeeper

Honey—An Overview

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Introduction

In this issue I will start a discussion about honey; especially honey products I see collected and processed by bees, and extracted or processed, packaged and sold throughout North America and elsewhere. This will allow me to share some stories and photos from various honey-producing operations I have visited, as well as to review this topic in a systemic manner.

Based on USDA Economic Research Service data* for 2009, 2,462,000 U.S. colonies produced an average of 59 pounds of honey, or 144,106,000 pounds. This earned $1.45 per pound or a total value of $208,236,000.00 for beekeepers to pay down debt and treat the kids to $3 movie night. This means the 'average' hive for the 'average' beekeeper generated an income of $85.55 if the product was sold at the wholesale level. If sold in smaller containers and with some marketing, this same honey production may be worth five to ten times that amount. This sort of marketing is essential for beekeepers with fewer than five hundred or a thousand colonies, since the cost of operating per hive is so large. Large commercial beekeepers are better able to keep the operational cost per hive lower only through the economies of large scale: large work crews, large trucks to move bees, large pollination income from almond pollination, and huge extraction plants. Some of these beekeepers supplement their income by selling increase (nuclei) hives each year—splitting the hives after the almond bloom or in the late summer after the bees finish their Northern pollination duties. Larger bee operations have much more risk, and when a crop fails to materialize or a new problem arises, they take a huge hit.

New beekeepers rarely produce the government's average amount their first or even their second year of keeping bees. Their inexperience helps keep the national production average low. Experienced beekeepers, from tenured small-scale to large commercial beekeepers, usually produce much more than 59 pounds per year as average production. They are much less likely to put their honey into 60 pound buckets or 55 gallon drums and sell it at prices closer to the $1.45/pound level, or lower than that, as 'average price' represents.

This honey production is a tiny amount compared to the value of bees for crop pollination. The value of the crops pollinated by bees is a huge number, into the billions of dollars, but the beekeepers who rent bees are getting an income about equal to the income from honey production. No grower is doing pollination fees by shares, or percentages of

At the honey display at Hunters near Indianapolis, IN. bottles of liquid honey outnumbered the comb honey containers (lower left) in this attractive display. comb honey is harder to produce. Younger customers do not know how to eat comb honey—they have to be educated.

*http://www.ers.usda.gov/Briefing/Sugar/Data.htm

Texas beekeeper Horatio Acevedo holds a bottle of his very dark honey. Sometimes honey this dark is a result of extreme overheating, but in this case it is the natural color of the honey in the comb.

the crop, unfortunately. If beekeepers took a percentage of agricultural crop production for their paycheck, they might be able to take the kids to a newly released, first-run movie.

What is honey?

Honey is currently defined as "a sweet food made by bees using nectar from flowers." (Wikipedia). The National Honey Board says, "honey is honey, it's just that simple. A bottle of pure honey contains the natural sweet substance produced by honey bees from the nectar of plants or secretions of living parts of plants. Nothing else. When scientists begin to look for all of the elements found in this wonderful product of nature, they find a complex of naturally flavored sugars as well as trace enzymes, minerals, vitamins, and amino acids."

Some hard-working folks have put a much more scientifically based definition of honey into the law books, and we appreciate their efforts. But for most of us, until we are forced to defend our product, we will regard honey as **a sweet food made by bees using nectar from flowers.**

How do bees collect and process honey?

Through the co-evolution of bees and flowers, our honey bees have a very tight dependency on the flowers they visit for **nectar**, the raw material of honey, and **pollen**, the protein food of bees. The nectar is a reward for bees to visit and pollinate the flowers—the cost of sex for plants. We will discuss pollen-collecting and use at some future time. Nectar-gathering is nothing new to most people—anyone who has watched bees in the flowerbed understands that bees work very hard to collect the nectar in flowers.

The nectar is produced by a special set of cells formed into the **nectary (**the nectar secreting gland of flowers). The nectary secretes nectar and the bees remove it. If nectar is not collected by visiting pollinators, the flowers usually reabsorb the nectar sugars for use another day or somewhere else in the plant. Unless collected by pollinators, nectar in flowers does not evaporate and is not washed out of flowers during a rainstorm. Most floral structure prevents excessive evaporation and the possibility of washing out nectar based on the shape and form of the flower itself. What beekeepers view as nectar being 'washed out' by a rainstorm is simply the plant taking back the sugars it produced to attract pollinators.

How do bees store honey?

In the flower, nectar is a watery sucrose solution. The percentage of sugar averages between 20 to 40%, with a range as low as 3-5% in pear flowers (which are simply not sweet enough for nectar foragers to visit) to a few floral sources that produce 60% sugar. While the bee collects nectar using her highly specialized mouthparts shaped into a soda straw, enzymes from the hive start to work on the nectar in the holding sac in the abdomen of the honey stomach. Like the crop of a chicken, this is a pre-digestive area of the bees system, and in there begins the chemical conversion of sucrose into the two simple sugars, fructose, and glucose.

The number of flowers a bee must visit to fill her honey stomach depends on the amount of nectar found in each flower she visits. Large nectar-rich flowers like tulip popular will produce more nectar per flower than the small florets of a clover flower. Keep this in mind when you read about the number of flowers a bee must visit—it is a variable figure, but the number is always huge, and each bee works systematically to fill her honey stomach.

Ripening honey

Returning nectar foragers must empty the

(l) Attractive frame of comb honey (probably with a thin foundation) on two small stands for table use. Plastic wrap keeps insects and fingers away from the product. (r) Knife and dish (to catch the comb cut from the frame ready to use on the table.

The stainless steel cutting and drain board for cutting comb honey to fit into plastic containers. Note the cookie-cutter like tool at the back of the photo.

contents of their honey stomach before they can return to the field to collect more nectar. House bees, a few days older than newly emerged nurse bees, but not yet old enough to be foragers, take on the duties of honey ripening. The forager spreads her mandibles and regurgitates a bubble of the nectar. The house bee extends her mouthparts and sucks the nectar into her honey stomach. After she has taken her fill, the house bee finds a spot on the honey comb in the area where nectar storage is underway, and quietly ripens honey by exposing it to the air. The forager, once her honey stomach is empty, returns to the field to collect nectar for as long as the flowers have it available. Some plants only produce nectar for certain daylight hours. Plants like the pumpkins and squash flowers bloom in the morning hours and close by midday. Other plants like buckwheat flowers stop secreting nectar at midday. Some of these foragers may be recruited to other flowers, or they may return to the next day (weather permitting) to the prime nectar-secreting plants.

The honey comb area of the hive is a marvel of multi-taking. Let's look at all the different things that happen there: The nectar ripening bees sit quietly and expose small quantities of the nectar to the heated air in the hive, and reduce the moisture level to below 20 percent. Other house bees consume nectar and honey and digest the carbohydrate food. Their metabolism converts the carbohydrates to long chain hydrocarbons called **beeswax.** They remove tiny wax scales from glands located at the underside of their abdomens, where there are eight wax plates secreting liquid wax into the air where it immediately hardens, and work each of the small scales into a chewing-gum mass of wax. This they apply to the growing wax comb. Other bees help shape, finish and polish the wax so it is formed into the beautiful and nearly perfect hexagon cylinder. Other bees on the comb are monitoring the temperature, and if the area drops below 94-95 degrees F., they flex their wing muscles like they do in the winter cluster to generate heat, keeping the fragile wax pliable for shaping.

As soon as newly drawn honeycomb is partially completed, the nectar processors deposit the ripening honey into the comb, letting evaporation continue to reduce the amount of moisture. Enzymes from the forager's and house bee's bodies have continued the chemical conversion into simple sugars. Traces of pollen from the foraging trip are in the honey, as are a number of minerals, vitamins and pigments from the flowers. These pigments give different honey sources very different colors. Pure basswood honey is very light in color, while pure buckwheat is very dark. Factors of honey flavor and color are separate, so the color does not necessarily affect the taste, as some darker honey is very mild and some light honey has a strong bite to the tongue.

Even light honey will darken with age, and with the application of heat. The worst thing a beekeeper can do is overheat honey, so it darkens and produces undesirable sugars.

When the comb is completely drawn and about three-eights of an inch from the facing comb (the bee space), the wax formers form a thin layer of wax on the stored honey. Without anything to support this dome of wax, they completely encase each cell with a thin wax coating. This reduces the evaporation of moisture in a dry environment and reduces the uptake of moisture in a damp location—even while sealed some moisture change is taking place.

Once sealed, the honey is available to the bees as they need it for food. They may need it right away for brood rearing or during the

(l) A frame of comb honey is being cut into sections to be packed in plastic cut comb honey containers.
(r) Finished sections from the popular Ross Rounds comb honey supers in the photo.

winter for survival. Honey bees hoard honey, and some colonies store more than they will ever use that season or next, and the beekeeper is able to remove some of the honey for personal or commercial use.

How beekeepers handle honey

Beekeepers may leave the honey in the comb or remove it by crushing or extraction using centrifugal force. Honey may be left in the honey comb and sold as a frame of honey. The frame may be placed on a simple holder and a plate put under the honey and cut or scrapped off the comb (if plastic). This is the least amount of handling, and for large honey users, it puts the honey on the table where they want it. A piece of plastic wrap or a towel can keep unwanted visitors off the frame when not in use.

The most popular method of selling honey in the comb is in **section honey**. This may be in an old-fashioned wooden frame, a round plastic ring (Ross Rounds), a half-comb cassette (Jack Hogg) or other systems where the bees are forced to store the honey into special structures. This requires more effort, so the product sells for a premium price in most markets. Colonies must be strong and the nectar flow intense. Many beekeepers crowd the bees into smaller areas when they give them the empty wood or plastic containers to fill.

Nearly as popular is the use of thin foundation in the **honey comb**. This produces an edible product that can be cut into chunks or strips and put into glass or plastic containers. Screened cutting surfaces are used to allow the honey to drain off the pieces before being put into the container. There is a metal cutter that allows you to cut a square piece of honey comb that will fit into a plastic container and a lid.

Ross Round comb honey being harvested.

Pieces of honey can be placed into glass and plastic containers and surrounded by liquid honey. This **chunk honey** is not as popular as other systems, but is a good way to use up pieces of comb from frames that are not perfectly formed, and the liquid honey that comes with it.

We will continue next month with a discussion on liquid honey production—extraction, cleaning and processing the liquid form of the precious product of the bee colony.

In November Dr. Connor will be at the Texas Beekeepers meeting with a special one-day program for small-scale beekeepers. Then, he appears at the Fifth annual Southern New England Beekeepers Assembly in New Haven, Connecticut as both speaker and co-sponsor. In December he speaks at the New York City Beekeepers Club on Bee Sex in the City, and then presents an evening program at the Pennsylvania branch of Brushy Mountain Bee Farms. After that he hopes to find a warm beach and hang out before the Big Bee Meeting in Galveston, Texas.

Viruses are obligate intracellular parasites that infect all organisms, from bacteria to humans. Their evolution represents a constant arms race with the host: Viruses need to reprogram host cells in order to produce progeny virus, but this is often successfully limited by the host antiviral defense, which in turn is frequently targeted by the virus, and so forth (Rehwinkel 2010).

A puzzling aspect of CCD is that when bee samples are analyzed, the "normal" immune mechanisms do not appear to be mobilized, despite the fact that the bees are rife with infectious pathogens (Johnson 2009). What could possibly cause such a suppression of the bee immune system?

If you'll look back at the bee immune system diagram in my last article, you can see that the ***induced*** bee immune response—the production of antimicrobial peptides—is dependent upon the upregulation of certain genes. Both this process and the bees' antiviral RNA response take place at the molecular level of gene expression. Certain pathogens, notably viruses, are able to sabotage this pathway.

Bees vs. Viruses

Viruses are the ultimate parasite—stripped to the absolute minimum. They are nothing more than encapsulated strands of genetic instructions. They are incapable of life on their own, being entirely dependent upon somehow getting into a host cell and hijacking the cellular machinery in order to trick it into producing more copies of the virus. They are so insidious that the line between host and parasite becomes blurred (about a twelfth of the human genome is viral in origin).

Surprisingly, this insinuation of viruses into host genomes appears to often confer evolutionary benefits, such as the introduction of new genes, or the acceleration of evolutionary change. Viruses may cause the extirpation (local extinction) of species, but any host that develops resistance to a strain of virus is then endowed with a competitive advantage over others that do not have such resistance (such as in the case of European human invaders to the New World, whose viral diseases decimated the Native Americans).

Bees are host to at least 18 viruses, nearly all being single-stranded RNA viruses. Some, such as Sacbrood virus have been with us for some time. Others are "emerging" pathogens—both Deformed Wing Virus (DWV) and Acute Bee Paralysis Virus (ABPV) were once considered to be "economically irrelevant" (Genersch 2010), then, with the arrival of varroa as a vector, they began to devastate colonies, and are still strongly linked to collapsing colonies today (Highfield 2009, Evans 2010, Hunt 2010).

Each time a virus mutates, or shifts hosts between bee or other insect species, it can suddenly cause epidemics as it spreads through a "naïve" population, just as new strains of flu virus can spread through the human population. For instance, Thai (or "Chinese") Sacbrood Virus has caused massive collapses of colonies of *Apis cerana* as it spread from Guangdong Province in 1972 to the whole of China and Southeast Asia (Verma 1990). Indeed, as this article goes to press, Dr. Jerry Bromenshenk's team is on the cusp of announcing that they have found strong indications that there may be a novel virus involved in CCD collapses in the U.S.

Back to School

The genetic blueprints for a bee are carried in its DNA, which are essentially sets of coded instructions, coiled into long strands called chromosomes, which reside in the nucleus of every cell. The coding elements are called "genes," of which bees have perhaps 20,000—about the same number as humans! Scientists are working to better understand the bee genome—about 50 laboratories worldwide are currently focused on molecular analyses of honey bees, as bees are a perfect experimental organism, since they are relatively simple, well studied animals, yet exhibit complex behaviors and unusual aging aspects.

The "action" of a virus infection takes place largely in the ribosomes—the organelles in the cytoplasm of each cell that "read" the genetic instructions on messenger RNA, and translate them into actual proteins. I'm introducing these terms because I feel that they are important if you wish to understand what is happening in collapsing colonies. If your eyes are starting to glaze over due to the use of "Big Words," please take a deep breath, and don't let the jargon scare you—it'll be worth the effort to get a grasp of what exactly is failing in the bee immune system. I understand that it's been a while for many of my readers since biology class, so please bear with me, and allow me give you a little refresher. A picture here may be worth a thousand words (Figure 1):

Until the advent of varroa, little attention was paid to bee viruses, and until very recently no one had any idea how the bee immune system fought viruses. The insect immune system is often chauvinistically dismissed as being more primitive than that of

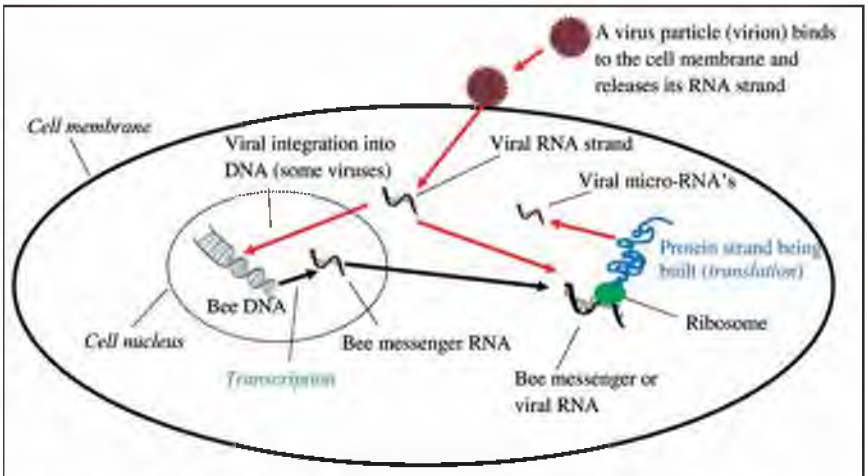

Figure 1. A greatly simplified diagram of how a virus insinuates itself into the genetic mechanisms of a bee cell. The bee's genes, encoded in its DNA, must be *transcribed* into messenger RNA, which act as couriers to carry the instructions out to the ribosomes (**black arrows**). The ribosomes then *translate* the instructions into the actual proteins and enzymes which do the cellular work. If a virus invades the cell (red arrows), the cell treats the viral RNA just like its own messenger RNA, and produces viral proteins or micro-RNA's, which then hijack the normal cellular processes. Components are not to scale. DNA strand graphic from Darryl Leja (NHGRI); virion from Wikipedia.

There are many "Big Words" related to this subject. Scientists therefore us a lot of acronyms, which can be confusing to the first-time reader. Below are definitions of the acronyms used in this article.

CCD	Colony Collapse Disorder—the definitive "symptom" being the often sudden disappearance of the adult bees, relative to the amount of brood present.
DNA	The double-stranded genetic blueprints (genes) for the function of an organism; carried in the chromosomes.
RNA	The single-stranded transcription product of DNA.
mRNA	Messenger RNA-- carries genetic code from DNA to the ribosomes for translation into proteins.
miRNA	Micro-RNA. Regulate the expression of genes, and thereby cell function.
RNAi	RNA interference. Used in "gene silencing" and antiviral immune response.
dsRNA	Double-stranded RNA. A temporary step necessary for the replication of RNA viruses.
siRNA	Short (or small)-interfering RNA. Short strands of RNA formed by cleavage by the Dicer enzyme. The critical component of the bee antiviral response.
DWV	Deformed Wing Virus
KBV	Kashmir Bee Virus
IAPV	Israeli Acute Paralysis Virus
ABPV	Adult Bee Paralysis Virus

I am also taking liberties with some terms. The term "symptoms" properly applies only to subjective sensations reported by a patient, whereas researchers observe "signs" of a disease in animals. The term "epidemic" only applies to human diseases; however, I'm using it anyway for bees, rather the proper term, "epizootic."

humans, since insects do not produce antibodies. However, insects have been surviving the attacks of pathogens since long before humans walked the Earth—they just do it a bit differently.

The bee antiviral response is based upon an ancient mechanism first discovered in plants (for an excellent history see Matzke 2004), but now known be common to virtually all forms of life—***RNA interference*** (RNAi). RNAi "silences" the expression of genes between the transcription of the genetic code and its translation into functional proteins.

The bee immune system exploits a quirk of typical viruses—that they are single-stranded RNA viruses (similar to human cold viruses), ***whose RNA strand can be directly translated into proteins by the ribosomes***. First we must better understand exactly how an RNA virus infects a cell (please refer back to Figure 1):

1. The typical bee virion "recognizes" a specific type of cell (typically gut cells, then later brain or salivary gland cells) by its specific "receptor" proteins on the cell membrane surface, to which they bind.

2. Once bound to the membrane, the virion releases its RNA strand into the cell cytoplasm (cellular fluid).

3. The cell's ribosomes mistakenly recognize the virus RNA strand as normal messenger RNA, and translate it into a long "polyprotein," which is then cleaved into functional virus proteins and micro-RNA's. These in turn suppress the bee immune system, and hijack the ribosomal translation functions to produce (or direct the formation of) the components necessary to form new virions (the protein coat, etc). At this stage, there is little direct antiviral response to the virus, and it is not yet replicating (yet it can still greatly harm the cell).

4. Finally, the virus needs to have its RNA strand replicated in full, in order to have it packaged into new virions (the assembly of which is directed by translated viral enzymes). To do this, the viral proteins produced by the cell use the original viral "sense" RNA strand as a template, and produce a mirror image copy ("antisense" strand) along it. At this point, there now exists for the first time a ***double-stranded virus RNA***.

5. If not suppressed by the bee immune system, the cell will then produce thousands of copies of the virus within hours! (For further reading, I recommend Roizman 1996).

Critical to the bee immune suppression of viruses is that ***the bee cell immediately recognizes the temporary double-stranded RNA's as being foreign***, since they are not normally produced in normal cellular translation processes. At this point, a picture is again worth a thousand words (Figure 2).

The process shown in Fig. 2 is amazingly effective and quick. ***It is remarkably clever in that the "diced" siRNA's, by being only about 25 nucleotides long, contain just enough code to be specifically identified as a foreign gene, yet are short enough to***

make it difficult for viruses to evolve resistance by slightly tweaking their genetic code (see MacRae 2006, which has some stunning graphics). Also of note is that RNAi only works on viruses that are attempting to replicate—if the virus simply "hides" without trying to copy itself, Dicer simply ignores it.

Even more important, is that for the RNAi response to be effective at the whole bee and colony level, the siRNA products must spread from an infected cell to other cells, and then to other bees. This appears to be exactly what happens in the bee colony. For the first step, bees produce a protein that ferries the siRNA products across cell membranes, so the immunity can spread to the whole bee (Hunter 2010). It has not yet been confirmed, but the guess is that they make their way to the jelly produced by nurse bees. Once in the jelly, they have been demonstrated to confer resistance to larvae that consume them (Liu 2010).

It was widely reported that honey bees possess fewer immune sequences than were found in other insects (actually, compared only to the mosquito and the fruit fly), but what is seldom mentioned is that bees "possess more RNAi pathway components relative to flies…, and because bees appear to more readily mount a systemic RNAi response than do flies…it follows that bees should be quite capable of battling viruses and arguably other pathogens through knockdowns based on double-stranded RNAs of pathogen expressed genes" (Evans/Spivak 2009). ***Notably, this form of response to viral attack is actually quicker than that of humans (Li 2004), and provides a long-term memory similar to that resulting from the antibodies produced in mammals.***

Now let's cut to the chase! In one of the most intriguing CCD papers to date (Johnson/Evans/Robinson/Berenbaum 2009), the authors compared gene expression between bees from CCD colonies originating on both the east and west coasts to that of bees from healthy colonies sampled before the emergence of CCD. They found that:

"Overall, elevated expression of pesticide response genes was not observed.

"Genes involved in immune response showed no clear trend in expression pattern despite the increased prevalence of viruses and other pathogens in CCD colonies.

"Microarray analysis revealed unusual ribosomal RNA fragments that were conspicuously more abundant in the guts of CCD bees. The presence of these fragments may be a possible consequence of … viral infection."

Note that the results did not indicate that pesticides were the problem. More surprisingly, the bees' induced immune response was not upregulated, despite their sick bodies being rife with pathogens! What could cause such a suppression of the normal immune response? The answer likely is linked to their finding of those "unusual ribosomal RNA fragments."

The paper cautiously offered various hypotheses to explain the presence of the fragments, but one of the authors, May Berenbaum, was more candid in an interview (Yates 2009):

"The one consistent indicator of CCD across samples collected at multiple times and in multiple places was the overabundance of ribosomal fragments. …. viruses 'hijack the ribosome,' taking over the cel-

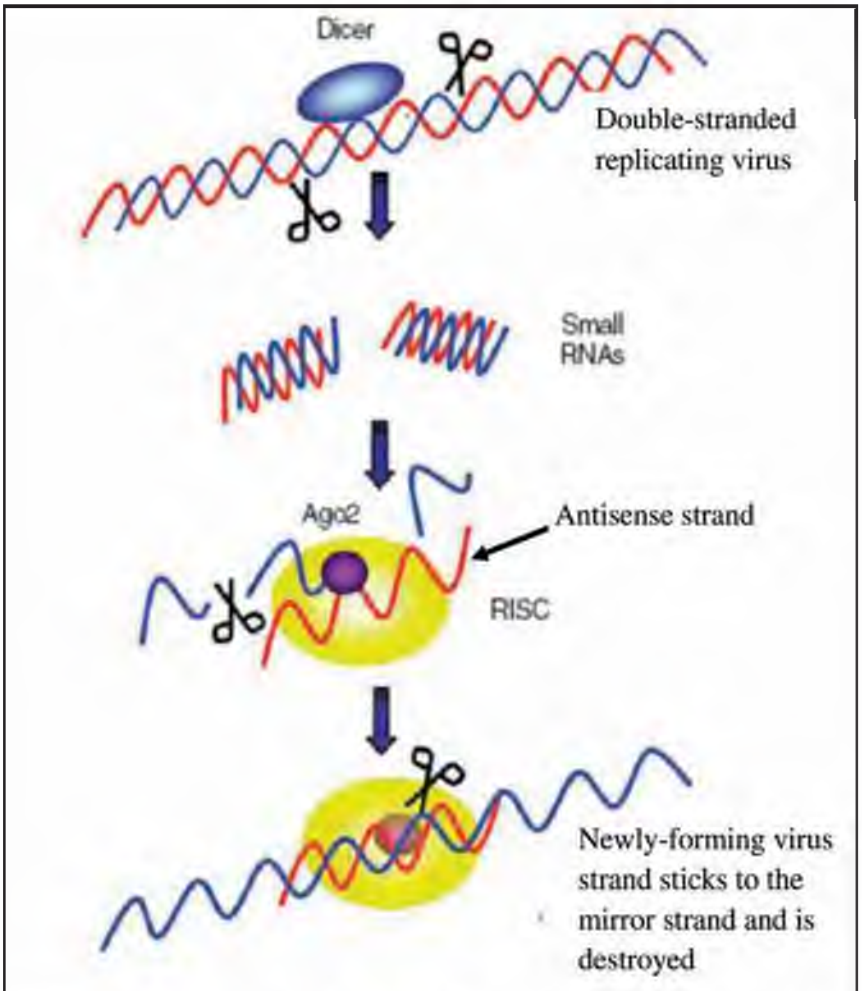

Figure 2. A greatly simplified illustration of how the RNA-silencing-based antiviral response works. In order to replicate, the single-stranded RNA viruses must rely upon the host cell to make copies of them. This process requires the temporary formation of a double strand of the virus--the "sense" strand acting as a template for its mirror image, the "antisense" strand). The bee cell contains enzymes called "Dicers" that immediately recognize the double-stranded RNA and cleave it into short pieces (siRNA--"small-interfering RNA"). These small pieces are then transferred to Argonaute (Ago) proteins, which bind to the single antisense strand of the chopped up virus RNA, thus forming the "RNA-induced Silencing Complex" (RISC). The bound strand acts as a template that binds to other newly-forming virus strands, which Argonaute then destroys. This action prevents the virus from being able to replicate. Illustration courtesy of Seokyoung Kang (2008) by permission.

lular machinery to manufacture only viral proteins."

What does she mean by this? Most bee viruses are classified as "picorna-like" viruses (pico = tiny, so "like the tiny RNA viruses" of vertebrates). Picorna viruses have an unusual way of hijacking ribosomal function. The ribosomes normally only translate messenger RNA that is marked with a "password" at one end. But picorna viruses have figured out a way to sneak into the middle of the ribosome without a password (Ongus 2006). So what they then do is to produce enzymes that remove the password from the normal bee messenger RNA's, so that they can no longer be read by the ribosomes! ***By doing so, they hijack the cell's ribosomes to produce virus proteins at the expense of bee proteins!***

Berenbaum continues:

"The loss of ribosomal function would explain many of the phenomena associated with CCD. If your ribosome is compromised, then you can't respond to pesticides, you can't respond to fungal infections or bacteria or inadequate nutrition because the ribosome is central to the survival of any organism. "

Take a moment to grasp the implications of the above. Bees infected by viruses can lose most immune function, as well as the ability to perform other metabolic functions, as a result of the viral infection!

Practical Application

Beekeepers will soon have at their disposal, from Beeologics, an antiviral medication that mimics the natural bee RNAi response. The product, Remebee™, is made by creating two discrete dsRNA components that are identical to "conserved" regions of the IAPV genome (Maori 2009; "conserved" means that all known strains of the virus have almost exactly the same sequence; one of the conserved regions is also found in the closely-related KBV and perhaps ABPV). This is the product with which I treated the colonies in the California trial that I described in "Sick Bees 2." I can now share with you some of the yet unpublished results (the results of the 2008 trials will soon be published).

Prior to the feeding of Remebee, some colonies already exhibited siRNA's for IAPV prior to us inoculating them with the virus (it had been previously confirmed that IAPV existed in some of my colonies). Of note, is that in the Florida trial, the non-treated hive with the highest natural siRNA levels before and after infection had the highest bee population (of the control group) at the end-point analysis. In contrast, the two control hives that had no siRNAs either before or after infection were either dead or were extremely weak at the end point. ***This finding indicates that colonies that are able to naturally ramp up an siRNA response to viruses are better able to survive.***

When fed to bees in syrup, enough of the product is absorbed into their gut cells so as to initiate the antiviral response: Bee Dicer proteins recognize the dsRNA as being foreign, and chop it up to create siRNA's, which then confer resistance to IAPV and KBV. It is noteworthy that in colonies fed Remebee, ***the diced siRNA's are not merely absorbed, but actually amplified by the bees, and still found to be present four weeks after the last treatment, which is a much longer-lasting effect than I expected!***

We fed the test hives Remebee prior to inoculating them with the virus cocktail, and then took samples two weeks after inoculation. After being infected, the siRNA levels increased dramatically in the hives that had been pretreated with Remebee, much more so than in the unmedicated control group. ***It appears that treating hives with Remebee prior to virus exposure primes them to initiate a stronger antiviral response should they subsequently be exposed to the virus.***

I will show the graphs for colony survivability in an upcoming article, but would like to make an announcement at this time: ***Beeologics has gotten FDA permission to experimentally release Remebee to beekeepers. They are looking for some commercial beekeepers who would like to test the product in their operations this winter. You can contact Nitzan Paldi directly at nitzan@beeologics.com.***

Viruses Fight Back

Viruses are unthinking strands of genetic code, so how do they deal with the bees' powerful RNA silencing immune response? The answer is that the viruses launch a pre-emptive strike by suppressing that immune response before it is initiated, and by further tweaking the ribosomal machinery to their benefit. This is akin to defeating an army by simply infiltrating its command headquarters and then rewriting the orders going out to the manufacturing sector, supply chain, and the troops.

Viruses are so good at this, that some species of wasps actually inject a specific virus into the caterpillars that they parasitize, in order to suppress the caterpillar's immune response against the wasps' larvae (Pruijssers 2006). Some insect viruses have even figured out how to prevent the last-resort immune defense of an infected cell—programmed sacrificial suicide (apoptosis)—allowing long-lasting "latent" infections! (Narayanan 1998).

This is cutting edge science, not yet thoroughly understood, but great strides are being made. Any papers or texts more than ten years old are likely out of date! The deeper I've looked into it, the more fascinating and complex it becomes, as we begin to grasp the tactics in the virus/host never ending "game" of suppression of the suppressors of the suppressors. Allow me to quote Scaria (2006):

The exclusive dependence of viruses on the host cellular machinery for their propagation and survival also make them highly susceptible to the vagaries of the cellular environment like short RNA mediated interference. It also gives the virus an opportunity to fight and/or modulate the host to suit its needs. Thus, the range of interactions possible through miRNA-mRNA cross-talk at the host-pathogen interface is

Sick pupae, typical of a virus epidemic as varroa levels peak in September. The best I can tell is that they are dying from DWV or perhaps other viruses. I see this generally happening if the mite infestation reaches about 10% (30 mites in an alcohol wash of ½ cup of bees from the broodnest). I started noticing these sort of symptoms several years ago, and am seeing more this year than ever! This photo is of a small patch of intense infection in one brood frame; in the rest of the hive, sick pupae and larvae were more scattered.

large. These interactions can be further fine-tuned in the host by changes in gene expression, mutations and polymorphisms. In the pathogen, the high rate of mutations adds to the complexity of the interaction network.

The last point of the above quote, about the high rate of viral mutations is of great importance. The RNA viruses are notable for their high mutation rate. ***Even the change of a single base molecule on the RNA strand can have a dramatic effect upon the virulence of the virus!*** (Shiboleth 2007).

What we beekeepers observe in the field is the year-by-year evolutionary process in action, as some colonies fall sick with odd symptoms, then see the population rebound as resistant survivors supplant the less fortunate. The bee/virus interaction becomes a sort of interactive game, played at the genetic and ribosomal level, but unfortunately observable only with specialized laboratory equipment. It is only recently that scientists even knew what to look for!

MicroRNA's

In the past decade, researchers have discovered that there are a whole set of genetic instructions whose functions had been previously overlooked. These are the genes that code for ***micro-RNA's***, which like messenger RNA's are shuttled from the nucleus to the ribosomes, but there, instead of coding for proteins, ***act as regulatory instructions*** for genetic expression (microRNA's are an extremely hot topic in biology, and well reviewed in Wikipedia).

Scientists have only recently discovered that bacteria (Navarro 2008) and especially ***viruses (Scaria 2006) either produce micro-RNA's or target host micro-RNA's essential to the host immune system***. Realize that every type of cell (gut, brain, hemocyte) contains fine-tuned mechanisms to regulate the expression of each of the thousands of specific proteins needed for it to function. Viruses can muck up these mechanisms to their own advantage (Pacheco 2010). ***The end result can be that the bulk of normal cellular products become the sort of ribosomal "trash" found in the CCD study cited earlier.***

It may appear that I've made a strong circumstantial case pointing at one or more viruses, perhaps in synergy with nosema, as being the agents of colony collapse. The strongest smoking gun is that we were able to duplicate the symptoms of CCD in test yards by inoculating colonies with a virus cocktail from another beekeeper's collapsing hives, and that suppression of those viruses appeared to cause some protection. However, I already had at least some strains of those viruses (plus *N. ceranae*) in my (otherwise healthy) operation prior to the start of the trial, *and* one of the control colonies did not seem to suffer. So I must be cautious about solely blaming the viruses as the ***initiating causal agents*** of colony collapse. I also, want to be clear that in this article I have extrapolated the current state of knowledge of similar viruses to the bee model, and that further work needs to be done before we can say that we definitively understand what is happening.

Inapparent Virus Infections

There is some good news, in that it is generally not in the interest of a virus to actually kill the bee, as ***the main method of transmission for the most virulent viruses appears to be via live bees either by oral/fecal transmission, or as a result of being vectored by varroa mites***. The exception to this live-bee rule is when the mid-aged hygienic bees transfer virions from virus-killed brood to other bees (common with sacbrood and DWV, but not necessary for the transmission of either). (Less virulent strains of virus may also "vertically" transmit in semen or through a queen's infected eggs).

Of interest is that the most virulent bee viruses tend to exist in an "inapparent" infection—a term coined by Australian virologist Denis Anderson (1988)—meaning that one can detect the presence of the virus in bees, but that there are no noticeable negative effects due to the infection. Another Australian (Benecke 2007) explains: "It seems likely that bees carry the virus at all times but only show symptoms when they are stressed in some way. ***Thus, bees may not so much 'catch' a viral disease but for some reason fail to suppress a virus they are already carrying***" [emphasis mine}.

So go back to my discussion of viral replication. The bee cell may ignore the virus so long as the virus doesn't attempt to actually replicate. ***The question then is what exactly triggers the sort of multi-virus epidemics typical in collapsing colonies? What are the causal agents, and which are mere opportunistic pathogens?*** I've already discussed some of the triggers—poor nutrition, chilling, environmental toxins, and parasite infection. Believe me, many researchers are working long, painstaking hours to try to be the first to figure out the specific cause or causes (the "etiology") of CCD (just read the "Methods" section in the following paper)!

In the most descriptive CCD paper to date, vanEngelsdorp, Evans, et al (2009), state that:

"While no single pathogen or parasite was found with sufficient frequency to conclude a single organism was involved in CCD, pathogens seem likely to play a critical (albeit secondary) role. CCD colonies generally had higher virus loads [higher titers across the board; KBV was especially prevalent in sick colonies] ***and were co-infected with a greater number of disease agents than control colonies"*** (55% of CCD colonies were infected with 3 or more viruses as compared to 28% of control colonies).

So what happens when there are multiple parasites suppressing the bee immune system at the same time, and screwing with their ribosomal functions? I will continue on that subject in my next article.

Acknowledgements

RNAi is cutting-edge science, the explanations of which are often buried in very arcane scientific journals; I thank Peter Borst for his tireless ferreting out of related research. I greatly appreciate the assistance of several scientists who have given their time to help clarify things for me. First, the Israeli virologists Ilan Sela, who identified and named Israeli Acute Paralysis Virus, and his associate Eyal Maori. Through Prof. Sela, I was introduced to RNAi, and to Nitzan Paldi, the inventor of the Remebee concept, with whom it has been a great pleasure to collaborate. I also wish to thank virologist Wayne Hunter, who brought his expertise with insect viruses to the USDA bee lab, and was a co investigator with me for the Remebee trials. Finally, Jay Evans of the USDA lab, who has been a workhorse for CCD research and bee immune function, has always been there for me to bounce ideas against, and to whom we beekeepers all owe a debt of gratitude for his tireless efforts.

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The National Honey Bee Disease and Pest Survey: 2009-2010 Pilot Study

by ROBYN ROSE[1], JERRY HAYES[2], JEFF PETTIS[3], DENNIS VANENGELSDORP[4], KAREN RENNICH[3], ROB SNYDER[4], MICHAEL ANDEE[4], NISHIT PATEL[4], KAREN ROCCASECCA[4], NATHAN RICE[3], DAWN LOPEZ[3], JAY EVANS[3], AND VIC LEVI[3]

Executive summary

This pilot study was conducted to 1) validate and trouble shoot the sample collection process we proposed to use for a national survey effort, 2) assess the infrastructures related to shipping, storing and analyzing the specimens, and 3) gather baseline data for a broader survey of honey bee pests and pathogens that was initiated in 2010. The participating states were California, Florida, and Hawaii and a total of 87 samples were collected.

We found that our collection protocol worked well, and found that shipping live bees is a good and viable alternative to collecting and shipping bees on dry ice; however, the rate of surviving bees decreases dramatically with transit times longer than 5 days.

In all, samples from 13 different organisms with known associations with managed honey bees were examined. We found three viruses, Deformed Wing Virus (DWV), Acute Bee Paralysis Virus (ABPV) and Kashmir Bee Virus (KBV) in all surveyed states. Chronic Bee Paralysis Virus (CBPV) and Israeli Acute Paralysis Virus (IAPV) were found in both California and Florida, but not in Hawaii. Slow Paralysis Virus (SPV) was not found in any samples. While *N. ceranae* was ubiquitous in all samples, *N. apis* was notably absent, none being detected in any samples. Tracheal mites and *Tropilaelaps* mites were also not found in any samples. Varroa mites were found in all states, and were found particularly abundantly in some Hawaii samples.

This survey was not designed to be comprehensive representation of the country, and the results should not be interpreted to mean the absence of certain pathogens in the US or in any one particular state.

Introduction

A pilot survey of honey bee pests and diseases was funded in 2009 by the USDA Animal Plant Health Inspection Service (APHIS) and was concluded in 2010. This survey was conducted in an attempt to document which bee diseases and parasites of honey bees are currently present in the U.S., and to examine all samples for *Tropilaelaps*, a parasitic mite not thought to be in the U.S. This pilot survey was initiated to validate and trouble shoot the sample collection process, assess the infrastructures related to shipping, storing and analyzing the specimens, and to gather baseline data for a broader survey of honey bee pests and pathogens that was initiated in 2010. The three states surveyed by this limited effort were California, Hawaii and Florida and a total of 87 apiaries, representing 696 colonies were sampled.

California, Florida and Hawaii were chosen because they represent high-risk areas that have many potential ports of entry, long growing seasons, and diverse agricultural crops. Twenty-five samples were collected from different voluntary apiaries throughout Florida, and fourteen samples from Hawaii. Forty-eight samples were collected from California, twenty-seven from hives originating in that state and twenty-one from migratory beekeepers who were in California under pollination contracts or other reasons. Coordination of this survey is in collaboration with USDA Agricultural Research Service (ARS) Bee Research Lab (BRL) in Beltsville, MD, Pennsylvania State University (PSU), the Florida Department of Agriculture and Consumer Services (FDACS) and USDA APHIS.

Survey Description

Live samples taken in the field were sent to USDA BRL and immediately frozen at -80 degrees C upon arrival. The frozen samples were held until molecular analysis was conducted. Molecular testing of the samples was focused on identifying

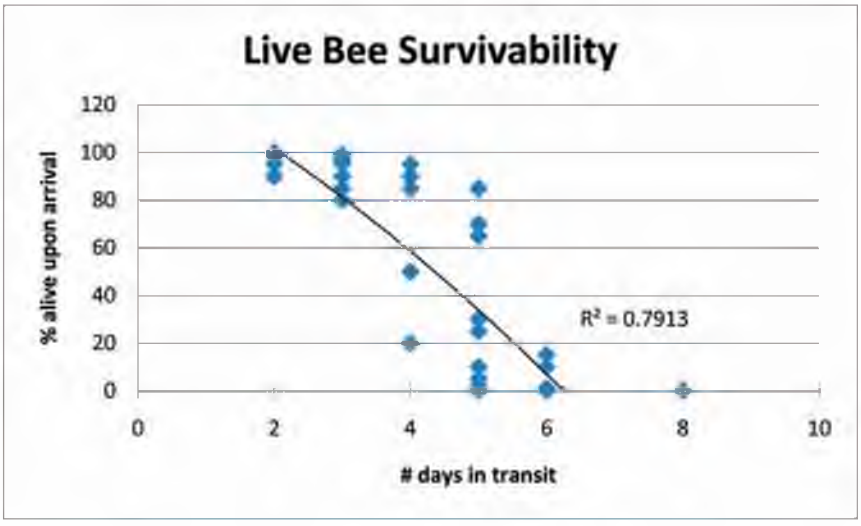


Figure 1: Live Bee Survivability Plot (R=.89)

1 USDA Animal and Plant Health Inspection Service
2 Florida Department of Agriculture and Consumer Services Division of Plant Industry
3 USDA Agricultural Research Service
4 Pennsylvania State University

Figure 2: Geographical Distribution of California Pilot Samples

Figure 3: Geographical Distribution of Florida Pilot Samples

the following viruses, and pathogens:

1. Acute Bee Paralysis Virus (ABPV)
2. Chronic Bee Paralysis Virus (CBPV)
3. Deformed Wing Virus (DWV)
4. Israeli Acute Paralysis Virus (IAPV)
5. Kashmir Bee Virus (KBV)
6. Slow Paralysis Virus (SPV)
7. Trypanosome sp.
8. *Nosema ceranae*
9. *Nosema apis*

The samples taken at the apiaries and preserved in alcohol were later inspected using microscopic analysis at Pennsylvania State University and USDA BRL to:

1. Quantify Nosema spores
2. Quantify Tracheal Mites loads
3. Detect Tropilaelaps Mites
4. Quantify Varroa Mite loads

Beekeepers participating in this survey were provided with a summary report on the average apiary level of Nosema, tracheal mites, and Varroa loads, in addition to the presence or absence of *Tropilaelaps*. This report was also furnished to each state-level apiary specialist. A separate report that presented the results from the molecular analysis of the sampled bees was distributed to the participating beekeepers and state-level apiary specialists. This report provided the participant with a positive or negative result for the six bee viruses targeted, the two Nosema species targeted, and the presence or absence of Trypanosome in the sampled apiary.

Part of the survey included a visual inspection of the hives before sampling; therefore, the presence of the following symptoms, pests and brood diseases was also recorded, but not analyzed, at the apiaries for each sample taken:

1. American Foul Brood
2. Black Shiny Bees
3. Chalkbrood
4. Deformed Wing Virus
5. European Foul Brood
6. Parasitic Mite Syndrome
7. Sac Brood
8. Small Hive Beetle Adults/Larvae
9. Wax Moth Adults/Larvae

Figure 4: Geographical Distribution of Hawaiian Pilot Samples

Evaluation of sampling protocol

Live bees were shipped via the U.S. Postal Service from each apiary to Beltsville, MD for molecular testing. In each live bee 'kit' was a petri dish that contained both a small amount of water and some hard "queen" candy for food for the bees. This kit contained approximately 12,000 live adult bees at sampling time. The percentage of bees lost in transit was directly affected by the length of time samples were in transit (Figure 1). There was a noticeable decline in the percentage of live bees surviving in sampling boxes when they took 5 days or longer to arrive. It is not known whether this was due to temperatures experienced during shipping or a lack of food or water or a combination of all three variables.

The geographic distribution of the samples for each state is given in Figures 2-4. The numerical markers on these maps indicate the number of apiaries assessed in that general location from July 2009 through June 2010. Samples from the Hawaiian Islands included Kauai, Oahu and the island of Hawaii (the Big Island).

Results

The results of molecular analysis are given in Figure 5. This graph shows the prevalence of pathogen detection in aggregate apiary level samples taken from all states. Neither Slow Paralysis Virus (SPV) nor *Nosema apis* were found in any samples.

The average Nosema load per bee (in millions of spores) and the average Varroa load per 100 bees are portrayed in Figure 6. As *Nosema apis* was not observed by molecular analysis in any sample, it can be assumed that all the Nosema identified by microscopic identification was *Nosema ceranae*. Prevalence of Varroa in samples ranged from no Varroa detected to almost 19 mites per 100 bees. *N. ceranae* levels ranged from none detected to over 4 million spores per bee. Tracheal and *Tropilaelaps* mites were not detected in any sample.

Conclusions

The sample protocol developed worked well and the shipping and storage methods

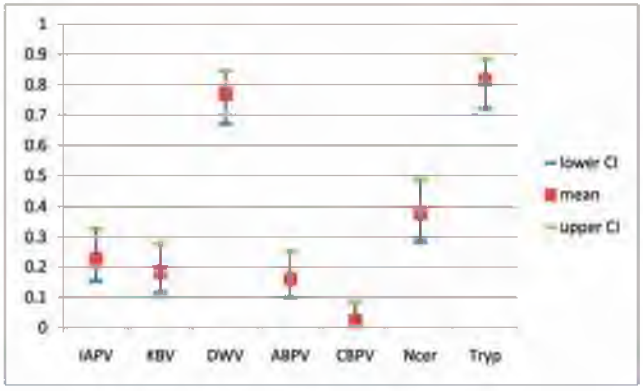


Figure 5: Prevalence of viruses and pathogens in sampled apiaries. The point estimate and (95% Confidence intervals are reported).

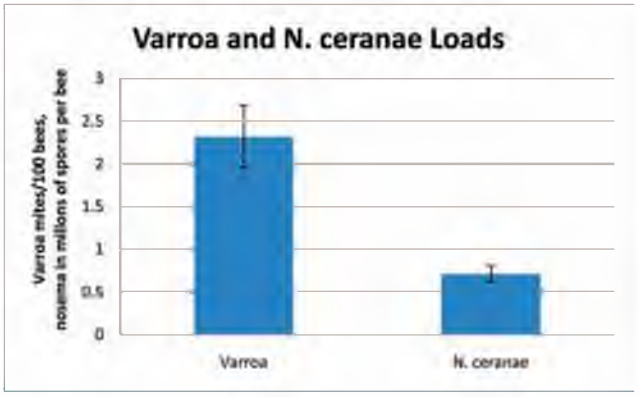


Figure 6: Prevalence of *Varroa* and *N. ceranae* in sampled apiaries. (Standard Error bars are reported.)

were sufficiently robust to justify the initiation of a national effort. The sample size and sampling effort were not robust enough to make any categorical statements about the absence of parasites in the US. So, while no *Tropilaelaps* mites were found in these efforts, neither were honey bee tracheal mites nor *Nosema apis*, both of which are known to be present.

The Birth of a Bee Museum

By M.E.A. McNEIL

A Chico, California, exhibition is kicking off plans for an interactive bee museum with a unique art collection.

Courtesy Chico Museum

"The Secret World of Bees", the current exhibit at the Chico Museum, is a rich taste of what is to come – a new bee museum. It will be in a fitting location, in an area full of bee lore, where most of the queens in the continental United States are produced.

A visitor entering the exhibition first encounters a small hexagonal room containing images of early beekeeping: a prehistoric cave painting, Mayan bee god, early Egyptian tomb carvings. An adjacent room reveals beekeeping tools and photos dating from the area's pioneers through the modern industry. A third large room houses an intriguing collection of bee-themed art and artifacts.

This museum project is born of synchronicity – a story with many beginnings. For one, in 2001, the 28 acre Patrick Ranch near Chico was bequeathed for use as an agricultural museum and educational center. It is now open, its purpose being to show the agricultural history of the Sacramento Valley through the lens of social and cultural history. A yearly event, the Threshing Bee, features harvesting and baling hay with horses and old equipment as well as horse, dog, and bee exhibits. Oliver Hill, of one of the early beekeeping families, runs an extractor, and twice a day a bee beard is grown.

When John Burghardt, the attorney who facilitated the endowment, was traveling in Tasmania, he came across a museum that focused on the local bee economy. He thought, "Our area is so rich with beekeeping, we ought to be educating people this way." The new Patrick Ranch Museum seemed like an ideal site for such a bee museum. Burghardt attended a local bee meeting, hosted by his friends Bob and Yvonne Koehnen, where the idea was embraced. Many beekeepers had historical items that they were willing to loan or donate. And there the concept gestated.

Another beginning to this museum is with Richard Marple, who is the source of a wondrous collection of art — less than half of which can be seen in the current exhibit. As a child, he loved art museums and classical music, later teaching piano professionally. Fascinated by the natural world, he kept birds and fish, acquiring his first bee hive in 1944, at the age of 14. From a branch library on the South Side of Chicago, he borrowed *A Living from Bees* by Frank C. Pellett. "I soon bought my own copy and started collecting bee books."

"In Chicago, somehow I got in touch with a British ambassador to the United States who had an old beekeeping book. It was a very early book in English by Thomas Hill. It turned out to be the first edition of one of the earliest beekeeping books, 1568. He wanted about $75 for it. I thought it was too much." Marple laughed at the naivete of his youth. "I thought it over and bought the book."

"Many bee books had beautiful pictures. That led me into collecting art. My first pictures were reproductions, but I soon realized I had to get original graphics."

Marple first studied beekeeping at the University of Illinois, which was a fertile environment for bee research. "Karl von Frisch came to the university and did some experiments there. I studied with the discoverer of the grooming dance and met Walter Kelley, Carl Killion, Elbert Jaycox." He visited Hamilton, Illinois, in 1950s. "I met the great grandsons of the venerable Charles Dadant. I liked his writings; I like his ap-

The Chico Museum has had 1,200 school children visit its current bee exhibits. Photo: M.E. A. McNeil

Yvonne Koehnen gives a talk at the Chico Museum exhibit, explaining how queens are reared by her family company, which has been in the area for over a century. Photo: M.E.A. McNeil

The opening of the beekeeping history and artifacts section of the Chico Museum exhibition. Photo: Melinda Rist

Richard Marple, whose extensive collection of bee-themed art was donated to what will be a new bee museum. Photo: Melinda Rist

Two modern prints from the Marple collection. Photos: Melinda Rist

proach to beekeeping."

After moving to California, Marple took a course at U.C. Davis with Eric Mussen and Norman Gary. He became a sideline beekeeper in California, with 25 colonies in Berkeley among the eucalyptus groves in Strawberry Canyon. He learned the bee plants of California traveling with Rimo Bacigalupi, the arborist at the University botanical garden.

He let go of his bees when no market developed for eucalyptus honey, adding wryly, "I got out of it before the mites." In 1983 he sold his collection of bee books, which he considers to have been the largest west of the Mississippi. But his fascination remained for collecting bee-themed graphics. Marple traveled extensively, searching for new pieces. "It's better if you travel with a purpose," he said. "I'd visit print stores and galleries with original art and ask if there is something related to bees. For every ten or so, I might find something. It's hit and miss. I love the hunt." Sorting through stacks at a book stall in Paris, he found a fine color print of a honey guide bird.

He visited Eva Crane, the International Bee Research Association editor, writer and researcher, at Hill House in England. In Egypt, he sought out ancient bee inscriptions and paintings. At an Athens museum, "I told them I was an amateur California bee historian and they took me into the basement to show me an ancient Greek hive."

He acquired many of his treasures close to home. Among prints at an antique store on Piedmont Avenue in Oakland was an original from 1600 by Jan VanderStraet, a contemporary of Breugel — a traditional Flemish beekeeping scene. "I could only see that it was old; it was one of those finds." At a rare print dealer in San Francisco, he came across a plate from the Rev. John Thorley's *Melisselogia,* 1744; it pictures a swarm settling on a branch outside a window, while inside a bewigged man at a desk searches through a pile of "stupefied" bees for a queen. Another find was chromolithographs of bees from 1890, printed from stone plates

A valuable original print by M.C. Escher. The Marple Collection. Photo: Yvonne Koehnen

A poster circa 1929. The Marple Collection. Photo: Melinda Rist

Song sheets are part of the popular art in the collection, which includes bee stamps and honey labels. Photo: M.E.A. McNeil

(l) Engraving from circa 1600 by Jan Van der Straet (1525-1605) who worked in Florence for the Medicis. The old practice of tanging, banging on pots to attract swarms, can be seen pictured in the background. (r) "The Beekeepers and the Bird Nester" is a print from a pen and ink drawing by Pieter Bruegel the elder (1525-1669), made circa 1568. The Marple Collection. Photos: Melinda Rist

with the colors laid down one by one.

One of the most prized pieces in the collection found him: "It got around that I collected beekeeping art and artifacts, and I got a call from a local person who had something." It turned out to be an original 1932 wood block print by the Dutch graphic artist M. C. Escher.

The exhibition is varied and not without humor: political satire, popular song sheets, a movie poster of Joan Crawford in "Queen Bee," as well as honey jar labels, coins, jewelry and stamps – "to add interest and amusement". There are useful bee-themed items as well, for example well designed skep-shaped string holders and honey pots. "Honey pots. They are never ending," he said.

Why create such a collection? Surveying the exhibition from the center of the room, one gets a distinct sense of the complex, aesthetically sophisticated person who created it. It is a personal compendium of his tastes and his wit. Richard Marple has designed his own legacy.

Part of the collection was shown at the Western Apiculture Society meeting in 1984 at U.C. Davis. Over the last 20 years, Marple tried to house the collection, which now numbers 275 pieces. After hearing of the proposed museum in Chico, he invited Yvonne and Bob Koehnen to his home to see the works; they envisioned this treasure at the nascent museum. When the board was able to offer a home for the works, Marple donated them to The Far West Heritage Association in February, 2010.

When the decision was made to kick off the museum fund with an exhibit at the Chico Museum, curators Heather McCafferty and Audra Hoyt had to hit the ground running. They had seven weeks to collect, mount, and install the show.

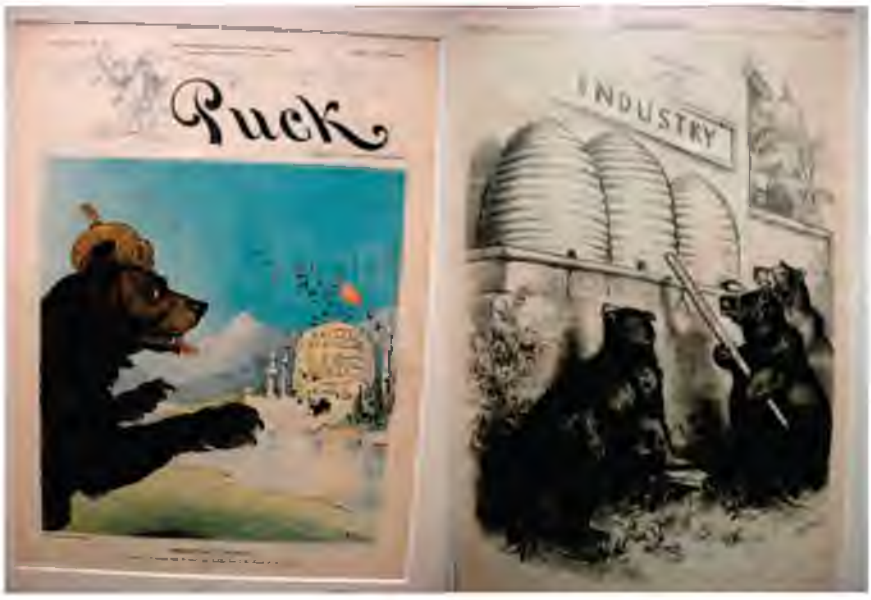
Chromolithographs, circa 1890. The printing technique, with each color applied individually with stone or plates, was invented in 1796. The Marple Collection. Photo: Melinda Rist

Hoyt, who has an MA from Boise State University in applied historical research, worked with the Marple collection. It was laid on tables in a large room for the selection of pieces for the exhibit. Marple had carefully recorded information for each item on cards that he had designed from various museums. But connecting the cards to the pieces that he knew so well was another matter for the curators who were new to the collection. At last, choices were made to show the geographic and historical diversity of the acquisitions.

A local art shop, Art Etc, donated significant framing and helped guide preservation. "In the back of our minds we were thinking of the museum to be built," said McCafferty, "So it was all done with the best quality for its future at the Patrick Ranch." For example, political cartoons by Thomas Nast, on newsprint, which easily deteriorates, were mounted and sealed archivally.

Research is Hoyt's passion, and she took pleasure in delving into as much detail as time allowed. She found that a large sign, "The Honey Pot", from late 18th, early 19th century England, would be designated as a pub sign, since "pub" appeared to be a generic term that typically included an inn. In investigating an 18th century page on beekeeping from the Diderot Encyclopedia, she learned that the encyclopedia was banned in France before the French Revolution because it discussed Diderot's ideas of freedom of thought.

McCafferty, the lead curator for the show, has a master's degree in museum studies from Chico State University. She had a daunting task: a short time and no practical beekeeping materials to start with. She invited the local beekeeping community to the museum and found primed partners, ready to contribute. Pat Heitkam brought a collection of historic smokers. Don Miller, an en-



Political cartoons featuring bears and bees. The British magazine Puck from March, 1900, portrays Russia as a bear looking at a hive representing Herat, Afghanistan, and saying "I would love to have the honey but I am afraid of the bees". Right, a Thomas Nast drawing from Harper's Weekley of May, 1878. Nast was the popular American artist who first drew Santa Claus. The Marple Collection. Photo: Melinda Rist

Chico Museum manager Melinda Rist conducts student tours, tailoring each one to the grade's study focus. She pauses by a favorite, a print by French entomologist Eugene Alain Feguy from 1924, which was made with stenciling using the Pochoir technique. The Marple Collection. Photo: Melinda Rist

tomologist at C.S.U., had students make specimen boxes of native and honey bees for the show. Richard Bordin and Chris Awad, of Bordin Bees, committed to bringing an observation hive to the museum every Thursday morning and picking it up when the museum closes on Sundays – for nearly nine months.

With loans and donations, McCafferty constructed the beekeeping wing of the exhibit. Her design demonstrates a new museum paradigm – interactive learning. Press a button and hear an explanation of early beekeeping. Try on a bee veil. Open a beehive and pull out the frames. Handle a smoker. Follow the pattern of the waggle dance on the floor. Open little doors that beckon with questions focusing on the complexity and value of the bees to find the answers.

The importance of beekeeping to the area is a theme, with a window sequentially dedicated to pioneering families, beginning with the Koehnens who have been breeding bees there for over a century.

More than 1200 school children have visited the exhibit, which is designed to follow the California educational standards. Melinda Rist, who manages the museum and guides the tours, has made a booklet selecting teaching points by the grade: kindergarten and first grade learn shapes, so she points out the hexagon in comb, the round patterns of the circle dance. Third and fourth grade studies lifecycles. Fifth grade learns more specialized functions of animals such as the queen, worker, and drone, as well as art, which takes them to the Marple collection.

The Chico Museum exhibit will close with a reception on Sunday, December 12. Local art teachers are gathering bee-themed work for an added flourish to the event. The art and artifacts will be packed in preparation for their new home. A building site has been selected at the Patrick Ranch, and funding is being gathered.[1]

There are bee museums in many countries[2]; the few in the U.S. include the Ohio State University Agricultural Technical Institute Beekeeping Museum in Wooster, Ohio, Honey Acres Museum in Wisconsin[3], and The U.S. National Pollinating Insects Collection in Logan, Utah.[4] It is fair to say that this new bee museum will be unique for its sophisticated art collection, which will include many more pieces than are currently exhibited, as well as for its interactive exhibits.

"We really wanted to wake people up, to inspire people, to educate the local community as well as visitors about the importance of bees, and that beekeeping is such an important part of our community," said McCafferty.

"Some pieces are rarer pieces that we in Chico would never have an opportunity to see without going to a big museum," added Hoyt.

Burghardt said, "This is a wonderful project. The beekeepers are the key stakeholders".

As for the culmination of fifty years of collecting, Marple said, "I'm in the closing years of my life, so I am happy that my collection finally has a future, that a lot of people will see it.[5] I was thrilled with it. It's a dream come true for me, a joy out of the blue."

Footnotes

1 Donations to the museum are tax deductible and can be sent to: Far West Heritage Association, 270 Boeing Ave., Chico, CA, 95973 and directed to the beekeeping museum account. Visit the website of the Patrick Ranch Museum, www.PatrickRanchMuseum.org, or Far West Heritage Association, www.FarWestHeritage.org, for more information about the ranch and the master plan.

2 For the Apimondia list of world museums, see: www.beekeeping.com/databases/musees.htm

3 Honey of a Museum at Honey Acres, PO Box 46 (N 1557 Hwy 67), Ashippun, WI 53003.

4 The collection is part of the Agricultural Research Service's Bee Biology and Systematics Laboratory, located on the campus of Utah State University in Logan. ARS is the U.S.D.A.'s chief research agency.

5 Marple has been working on a history of California beekeeping, based largely on the papers from the UC Davis archives of Lee Watkins, a California beekeeping historian.

American Bee Journal Editor

Roy A. Grout

and Editors to Date

by M.G. DADANT and ROY A. GROUT*

It naturally follows in an organization, like Dadant & Sons, publishers of the *American Bee Journal*, that an eye is kept out for the future. C. P. Dadant, retired in 1904, turning over the affairs of business to his three sons, Louis, Henry and Maurice, who subsequently formed a partnership. They, in turn, agreed that each should bring a son or son-in-law into the business, the latter condition being made for Henry who had no sons.

This was the situation in 1929 when Roy A. Grout graduated from Iowa State College with a degree in architectural engineering. With the rest of his class, he was faced with the problem of what to do because the country was being plunged into the Great Depression, and he had fallen in love with Marjorie, the eldest daughter of Henry Dadant. Inasmuch as they had no sons, Henry and Bertha Dadant also were faced with a problem. Thus, it was proposed that Roy try beekeeping for a summer and, should he find it to his liking, continue with the goal of a Master's degree with a major in apiculture and a minor in chemistry, and this would enable Marjorie to also finish college.

So it happened that in June 1929, Roy hitchhiked his way to Fargo, North Dakota, where he spent the summer working for Charles S. Engle, a well-known beekeeper, for $50 a month and his keep.

Finding beekeeping to his liking, he returned, married Marjorie in September, and both resumed their education at Iowa State and both graduated in 1931 with their respective degrees. It is of interest to note that during the summer of 1931, while working on his Master's thesis, he was sent to western Iowa to help with the grasshopper scourge, and returned one evening to report extensive grasshopper damage to a field of corn. His superior laughed because the damage had been done by hail, but his research did eventually supply material for his first article entitled "How Grasshoppers Reduce the Honey Crop," coauthored by his superior, George C. Decker, that appeared in the *Journal* in 1931.[1]

Roy A. Grout came to Hamilton in September 1931 to join the staff of Dadant & Sons. Although his work over the years was primarily concerned with production, the development of new products, one of which was Gilt-Edge comb foundation, and quality control, he kept his fingers sticky with propolis through experimental work and testing products with the bees. He also enjoyed making trips visiting beekeepers and attending bee meetings, and these were reported in the *Journal*. Thus, we find his name listed as a contributor to the *Journal's* columns some 15 times before it appeared on the masthead in 1945. And at least 50 contributions have appeared since then.

During the years of WWII, he became involved in industry affairs representing the beekeeping and honey industries on Washington committees and meetings of the Office of Price Administration and the War Production Board. This gave him the opportunity to report these activities and to interpret regulations through the columns of the *Journal*. In 1949 and 1950 he served as president of the American Beekeeping Federation and was prominent in the endeavor that brought price support for honey to the

Roy Grout was an editor from 1945 until 1972, but wrote many articles for the *Journal* before and after his tenure at the magazine. His many accomplishments included research and development at Dadant & Sons, Inc., in additon to his editorship of several editions of the book, *The Hive and the Honey Bee.*

During the years of World War II Roy Grout spearheaded the beekeeping industry's efforts to provide sufficient beeswax for the war effort. The *Journal* sponsored a slogan contest to promote beeswax production for the war effort. Addison Webb of New York City won the contest with his slogan, "Let the Bees Wax the Way to Victory." This slogan was used from September 1942 until after the war ended.

* Former *American Bee Journal* editors

James Dadant was editor from 1940 until 1946. He also worked on revising *The Hive and the Honey Bee* as it transitioned from a single author to a multi-author textbook.

Vern Sisson was editor from 1965 until 1974. He also worked with Dr. Bud Cale in the Dadant Hybrid Bee Breeding Program.

Bill Carlile was listed as an editor from 1974 until 1977, but actually started his popular "Timely Chats" column in the magazine in 1969.

industry. For several years after this, he served on the Washington Committee of the Federation.

Before telling the part that he played in the revisions of *The Hive and the Honey Bee* we must digress somewhat from this story, but it gives an opportunity to tell about another ABJ editor and pertains to the partnership agreement for each to bring into the business a son or a son-in-law. This concerns James C. Dadant, the only son of Louis Dadant.

Finishing college at Grinnell, Iowa, in 1942, James immediately joined the staff of Dadant & Sons, working with the bees and helping with the *American Bee Journal*. Although his name appears as a contributor only three times, the first being an article entitled "From Rag Rolls to Modern Smoker," in 1938,[2] his name appears on the April 1938 masthead as circulation manager. The January 1940 issue advanced him to the rank of editor and he remained in this position until the January 1946 issue.

We have previously stated that mastheads do not tell a complete story, nor does his *Journal* record that covered a span of less than 10 years. G. H. Cale, Sr. tells the most complete story and refers to him as "a fine musician, a vivacious writer, and an excellent analyst."[3]

Early in the 1950's, James was assigned the task of revising the book entitled "Langstroth on the Hive and the Honeybee." This was the C. P. Dadant revision in 1927 and was called the "Twenty-Third Edition." After an exceptionally fine analysis of the problem, James determined upon the following plan for the new book that is best described in the Foreword of the 1946 edition:[4]

"Over twenty years have passed since the last important revision, and so many changes have occurred in beekeeping that a new book becomes necessary. Therefore, it no longer can be called a revision of Langstroth's work. It is instead the combined contributions of several men, each writing the part with which he is most familiar. To this new volume we have given the title, *The Hive and the Honeybee*."

But World War II was to intervene in these plans since James enlisted in the Army in the spring of 1942 and, although he did return for a brief time after the war, he became a court reporter and died suddenly May 27, 1954, at the age of 44.

Thus, the task of producing the new book fell to Roy A. Grout, with the assistance of the staff of the *American Bee Journal*, a task for which he was completely untrained and with no experience other than writing articles for the *Journal*. However, the first edition of *The Hive and the Honeybee* was published in 1946; it was revised in 1949 and again in 1953.

In addition to editing the first edition, Roy wrote Chapter II entitled, "The Beekeeping Industry;" Chapter XVI entitled "Extracting the Honey Crop;" Chapter XXI entitled, "Marketing the Honey Crop;" and Chapter XXII entitled, "Production and Uses of Beeswax."

In the 1949 revision, he contributed Chapter I entitled "The Beekeeping Industry;" Chapter XI entitled "Extracting the Honey Crop;" and Chapter XV entitled "Production and Uses of Beeswax." He also drew the frontispiece for this edition. In the 1953 revision of the book, in addition to editing, he wrote Chapter XI entitled "Extracting the Honey Crop;" and Chapter XVI entitled "The Production and Uses of Beeswax."

The last revision which he supervised was the 1963 edition. "The Hive and the Honey Bee," as it now is known, has sold widely, is generally used in this country and abroad in colleges and universities, and has been translated into Russian, Italian, Spanish and German.

Returning to the story of the *American Bee Journal*, in addition to reports of trips and meetings and interpreting Washington regulations for readers, probably Roy's subjects of main interest were beeswax, pollination, honey marketing and honey houses. Beeswax was a natural for that was the material with which he mostly worked. When a shortage of beeswax faced the country due to World War II, he started a beeswax-saving campaign with an editorial in 1942 entitled "Producing More Beeswax—Saving More Beeswax."[5] The slogan selected for the campaign was "Let the Bees Wax the Way to Victory,"[6] and this was used in the *Journal* until beeswax became plentiful after the war.

Making some use of his training in architectural engineering, he began a series of articles on honey houses and the first one was entitled "Functions of the Honey House."[7] Pollination and marketing of honey also were favorite subjects.

Although his work largely was with plant production and matters not directly related to the *Journal*, the March 1945 masthead lists him as associate editor, and this continued until the January 1965 masthead gave him the full status of editor, a title which he held through 1972.

In the 1960's the need arose for someone to follow up and to assist Dr. G. H. Cale, Jr. in the hybrid queen program and also to help his father, G. H. Cale, Sr., with the *Journal* during the winter months, so Vern Sisson

was employed and came to Hamilton in June of 1964. By that time, Vern had been awarded his Master's degree at the University of Minnesota with a major in entomology and a minor in plant breeding.

Vern had worked in the hybrid bee breeding program for one summer and had spent a short time at the side of G. H. Cale, Sr., being tutored in the task of editing and publishing the *American Bee Journal*, when it became necessary for Roy and him to take over its publication due to G. H. Cale, Sr's. sickness and death.[8] Thus, the January 1965 masthead lists his name as associate editor and the February 1966 issue shows him as editor along with Roy Grout and M. G. Dadant.

Vern Sisson left the Journal in 1974. At that time, Joe Graham was hired as editor and worked with Bill Carlile until 1977 when Bill retired. However, Bill continued to write his popular "Timely Chats" column for several years after retirement. Bill had started this column in 1969 and enjoyed passing along his many years of practical beekeeping wisdom along to readers. Before working on the *American Bee Journal*, he had spent many years as a commercial beekeeper, working at the Dadant beeyards, as well as with his own hives. He also spent a number of years working for Dr. G.H. Cale, Jr. as an assistant in Dadant & Sons, Inc., Hybrid Bee Breeding Program that produced the Starline and Midnite hybrid breeder queens sold to bee breeders throughout the country. Mr. Carlile died in 1985 and as a memorial to his love of beekeeping and beekeepers, his wife, Rachel, published a book in 1986 containing his many "Timely Chats" columns.

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Honey Bee Biology

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A Queen Rearing Method with Top-Bar Hives: Grafting Small Batches of Queens, Part 2

In the previous article, I described my queen rearing method and ended by showing mature queen cells from a cell-builder colony. I want to begin here by discussing two interesting cases with cell builder colonies from this past season. Recall in this procedure the cell-builder colony is queenless. It receives the newly grafted cell cups and constructs the queen cells. (Some queen rearing systems, particularly for producing hundreds of cells, have separate hives for "starting" the new grafts, which are moved after 24 hours to other colonies that "finish" constructing the cells. The previous article and this one are geared for grafting small batches of about 20 – 30 queen cells. Just one colony, the cell-builder colony, starts and finishes the queen cells. While I can routinely get over 90% acceptance with the newly grafted larvae in the queen cell cups even in a summer dearth with temperatures climbing to almost 100°F, occasionally I do have "bad grafting days" and acceptance is poor. So, I just repeat the graft. Sometimes a hidden problem is responsible for the poor acceptance. When stocking bees in the cell-builder colony, the usual procedure is to find the donor colony's queen and set her aside. That does not guarantee, however, that the donor colony is queenless. Colonies occasionally have two queens, which could be an older queen being replaced by a daughter queen. The pair coexists for a while. I have even watched this coexistence in my observation hives.

Here are two interesting cases I encountered this past summer (during a dearth) from stocking cell-builder hives. Hive number 27, had terrible acceptance of the new grafts. Almost all the queen cell cups were empty when I checked them the day following the graft. All the work transferring the tiny larvae, keeping them from drying out, getting them quickly into the cell-building hive was – wasted. Very distressing. Hive number 106 of the same graft, done at the same time, had near perfect acceptance. Hurray for hive 106! The next day I repeated the graft for number 27, getting similar poor results, only four cells of 20 were accepted, which I just let grow. I had my suspicions but became busy with other hives. Three of the cells survived to be sealed (pupal stage). Then, the underlying cause became more obvious. One of the sealed queen cells had a hole in its side, indicating a possible queen in the hive (the developing queen could have also perished and the workers were dismantling the cell). Even though the combs were jammed full of syrup, a typical condition from all the feeding, I found some queen-laid eggs. (One egg per cell for queens, not multiple eggs in a cell, which indicates laying workers.) The colony was not queenless. Yikes! No wonder the bees would not start rearing all those queens. A queen could crawl around on the cell bar the whole time. Curiously though they did start four queen cells.

The second case, hive 125, was quite memorable. The colony accepted 15 out of 16 cells (94%). (In that batch, I was grafting two rows of eight cells on one cell bar for a total of 16 cells.) Four cells were dismantled in the larval stage, a number I considered large and somewhat troubling. Within a couple of days after the bees capped the queen cells, I found a side-hole in one of them. The damaged queen cell prompted a brood nest inspection where I found a small patch of eggs. This cell-builder had a queen roaming among the queen cells, too! Most striking though, virtually all of its new grafts, 15 cells, were accepted and most of the queen larvae survived to the pupal stage. Even though that occurred, the bees in the cell-building hive should be queenless. (Other methods have a queen in the hive, but she is separated from the queen cells by a queen excluder. I can also do that with top-bar hives.)

How can one make sure the bees are queenless? This is a problem confronting frame-hive beekeepers, too. One solution is to run the bees through a sieve box when

Figure 1. My homemade sieve box.

Figure 2. Removing the queen cells from the bar. I gently separate the wax base of the queen cell from the bar with my pocketknife. The frame that holds the cell bars is in the background.

Figure 3. A bar of queen cells with a newly emerged virgin queen among the bees. She is on the second queen cell from the right, yellowish in color with no bands.

Figure 4. A close view of the newly emerged virgin queen inspecting a queen cell.

starting the cell-builder colony. In its simplest form for a frame hive, a sieve box would be an empty super with a queen excluder for the bottom. All that would go temporarily on top of a brood chamber, which would serve as the cell-builder hive. The bees, shook in from above, would run down through the excluder to the stocked combs of honey and pollen below.

Of course, my sieve box is adapted for top-bar hives. I had to build it with wood sides and cut a queen excluder to fit for a bottom (see Figure 1). At the top of one side of the box, I stapled on a towel so I could flip it over and quickly close off the top of the box. In the middle of the towel, I cut a small hole to blow smoke under the towel without lifting it up. The sieve box mounts on the rear of the top bar hive, and the combs for the cell-builder colony are in the front. I shake some bees in the sieve box, flip the towel over them, and give just a little puff of smoke through the hole in the towel to start them through the queen excluder. The bees will readily run to the front of the hive because it's dark and has the smell of comb. After repeating that a few times, I check for a queen, before too many drones build up on the excluder.

The main rule is to inspect the sieve box carefully for queens before changing to the next donor colony. The sieve box eliminates the need to hunt for queens in the brood nest. You just look for them in the sieve box, which is quicker. I painted the inside of my sieve box white to help in finding queens, especially in the corners. In my sieve box the excluder is the metal bar type, which acquired an old dark patina with age. I'm wondering if the new white plastic queen excluder, the thick bar type, might work better in the sieve box. And after years of service, I might retire my old sieve box and build a new one. After running the bees through the sieve box, it's a safe bet they are queenless. I move the hive from the out-apiary to beside the bee house. Sugar syrup feeding starts immediately, and if not much pollen is available from the field, I provide a pollen substitute. The queen-cell bar with the new grafts goes in the cell-builder after 24-hours.

A couple days before the queens emerge (10th day after the graft), I cut the cells from the bar (see Figure 2). The attachment of the cells to the bar is not very strong, which is the way the queen cell cups were attached, so the separation is easy. Sticking to a schedule is very important in queen rearing. Figures 3 and 4 show what can happen if the queen cells remain together for too long. I found a downy white queen, just emerged, crawling among the other queen cells on the bars. Upping the ante, another queen had just emerged too. The pair had not yet met in mortal combat. My timing was right on the razor thin line between "late" and "too late." I quickly caged the soon-to-be combatants.

A small box containing a piece of sponge is the way I carry the queen cells (see Figure 5). I cut grooves into the sponge to hold the queen cells in rows. The grooves are soft, accommodating the slight variation in the size of the queen cells, but still support them snugly. (I cull out any small or oddly shaped cells.) The sponge also helps absorb shocks to protect the queen cells while in transit. With the queens near the end of their development, the cells can be out of the warmth of the brood nest for short periods of time. As a general rule, I try to keep it to less than a half an hour.

With queen cells in hand, I distribute them one per mating nuc. My mating nucs are just top-bar hives one foot long (holding seven combs). Some hives have a partition in the middle to form two smaller mating colonies (similar to partitioning a brood chamber). Inserting the queen cell in the comb is easy because of the thick wax base of the former queen cell cup. I find an empty patch of comb and make a depression. Then, I press in the queen cell, pushing on the

Figure 5. A box for carrying queen cells. Grooves cut in the soft sponge hold the queen cells.

Figure 6. A queen cell placed in a mating nuc comb.

Figure 7. Top-bar observation hives in the bee house.

thick base (see Figure 6).

As mentioned in the previous article, I graft the queen cells in my bee house where I keep 30 observation hives. When not needed for experiments, I can run these hives like little mating nucs. I usually start about five of these observation hives at one time with combs and bees from the out-apiaries. Figure 7 shows six of the hives at the end of the bee house. About 10 days later, even after dark when the bees have stopped foraging and quieted down, I can look for eggs, young larvae, and queens. The hives pivot on their entrance pipes, so both sides of a comb can be quickly inspected. I use a small flashlight to shine inside the cells (through the glass). If I cannot find brood or a queen in these small colonies, at night no less, she is most certainly lost. I mark the hives with laying and lost queens, eliminating that search time from the day work schedule. Those hives get the next batch of queen cells.

Opening these observation hives is easy, in this case to remove queens and put in queen cells. The glass panes are only held on the hives by homemade metal clips. There are no grooves for the glass typical of other observation hive designs, which are more for public viewing. Mine are not for that. To open a hive, I remove the clips, slip a hive tool between a removable wood strip and top bar and gently pry (so I do not pry directly against the glass). The glass easily separates from the hive. I can open a hive in 30 seconds or less. The interior of the bee house is dimly lit, and any bees flying away from an opened hive are attracted to the daylight through a door. With fine sand paper, I have dulled the edges (both sides) and corners of the glass panes so I can handle them safely. With 30 observation hives, each easy to observe and open, the whole set-up runs like an indoor mating apiary. (My working conditions are right sweet. Where else can you work mating nucs and sit in a roller chair?)

And finally for the cell-builder colony, I use it just once for rearing a batch of queens. After that it can be divided up to make a few more mating nucs. Or it can be kept intact, given some brood, and one of its queen cells, then let it grow as a new colony. This way the queen production generates more new colonies.

Acknowledgments

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Managed Pollinator CAP
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A National Research and Extension Initiative to Reverse Pollinator Decline

http://www.beeccdcap.uga.edu/
http://www.extension.org/bee%20health

Wild Bee Status and Evidence for Pathogen 'Spillover' with Honey Bees

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For pollination services in the majority of fruit and vegetable industries, honey bees (*Apis mellifera* L.) remain the most economically valuable. However, many other species of native and a few species of managed bees are important contributors to pollination (Berenbaum et al. 2007, Winfree et al. 2007, James and Pitts-Singer 2008). In fact, for some crops, honey bees are less effective pollinators when compared to other bee species (Klein et al. 2007, Dafni et al. 2010) such as some solitary bees (e.g. Andrenidae, Halictidae, Megachilidae) or the social bumble bee (*Bombus*). However, only a few species of non-*Apis* pollinators have been successfully cultured and are available commercially. Bumble bees are playing an increasingly large role as managed pollinators, with many thousands of reared colonies used for pollination around the world, particularly for tomatoes and bell pepper in greenhouse facilities. In North America, *Bombus impatiens* Cresson is now the only commercially significant species and alfalfa leafcutting bees, red mason bees, and blue orchard bees are also cultured (James and Pitts-Singer 2008).

Owing to their critical pollination services, we are working on several studies under the small 'non-*Apis*' project that lies within the Managed Pollinator CAP. Our main objectives are to survey pathogens in native and commercial populations and to study both lethal and non-lethal effects of insecticides, particularly the new chemistries. In this month's Managed Pollinator CAP column, we will present background and results of our pathogen studies, which are done in collaboration with Dr. John P. Burand, who is also at the University of Massachusetts.

Authors Anna Morkeski (left) and Ann Averill

Status of non-*Apis* pollinators

Honey bees are not the only pollinators at risk. Native bee species have declined in diversity over the years and this is causing heightened global concern, especially owing to the possible impact on natural ecosystems (Potts et al. 2010). However, owing to the scarcity of long-term population data, the strength of evidence for decline varies among taxa (Berenbaum et al. 2007). Decline is best established in the bumble bees; a decrease in both abundance and range for some species has been seen in Europe, North America, and Asia (Williams and Osborne 2009). In the US, toward the end of the 1990s, several closely-related species in the same subgenus [*Bombus franklini* (Frison), *Bombus affinis* Cresson, *Bombus terricola* Kirby, and *Bombis occidentalis* Greene] underwent extensive or total population collapse (Thorp and Shepherd 2005, Colla and Packer 2008, Williams and Osborne 2009).

Potential causes of decline in *Bombus* have been suggested, including climate change, pesticides, land-use changes, agricultural policies, competition, disturbances to reproductive habits, and pathogen intro-

Bumble bee foraging in weed patch near cranberry bog in Sandwich, MA. (photo by A. Averill)

duction. However, stresses may vary among species, and to complicate matters further, Williams and Osborne (2009) conclude that "…of course the factors that threaten a species may be multiple, correlated, interacting, and may differ among areas making the precise contributions or of causes difficult to establish." Fortunately, many studies are moving ahead to evaluate potential 'drivers' of decline (Potts et al. 2010) and some degree of baseline understanding may be established in the near future. For example, a recent comparative analysis of characteristics of *Bombus* populations in Britain, Canada and China suggest that those at greatest risk for decline have narrow climatic ranges and may exist closest to the edges of their climatic ranges (Williams and Osborne 2009). In North America, the most widely accepted, but unproven, cause of decline in the small group of closely related *Bombus* (discussed above) is the introduction of a novel strain of pathogen from Europe (Thorp and Shepherd 2005). The theory advanced is this: while North American species of bumble bee were being domesticated alongside European species in facilities overseas, they became infected with a strain of *Nosema bombi* endemic to the Old World, which was then brought back to rearing facilities in the United States and/or Canada. This pathogen is a unicellular microsporidian that reproduces in the Malphighian tubules, or kidneys, and forms resistant spores that are expelled in feces. Infection may result in abdominal distention and paralysis. The theory maintains that this introduced European strain had been serially passed on to successive generations of bumble bees reared commercially in North America, and then moved into wild populations when the purchased bees were placed in fields and greenhouses for pollination (Colla et al. 2006, Otterstater and Thompson 2008). Furthermore, this theory holds that the less closely related *B. impatiens* is more resistant to the disease caused by *Nosema bombi* than the closely related *B. affinis, B. franklini*, *B. occidentalis*, and *B. terricola*.

What do we know about *Bombus* parasites/ pathogens in North America?

Compared to other geographic regions, much more is known about *Nosema bombi* infection in European species of bumble bees, where it has been characterized in eight species. To date, analysis of the genetic variance of *Nosema bombi* has been based on ribosomal genes, which typically contain very little variation within a species (Tay et al. 2005, Klee et al. 2006, Shafer et al. 2009). These genes don't mutate rapidly enough to accumulate enough differences in the nucleotide sequences of DNA for the parasite's recent transmission patterns or current population structure to be discerned. Efforts to identify other *N. bombi* genes to characterize for variation have been unsuccessful thus far, but the entire genome of *Nosema ceranae* was recently sequenced (Cornman et al. 2009). *N. ceranae* and *N. bombi* are closely related, so *N. ceranae* genes identified in that project may allow regions of *N. bombi* to be targeted and sequenced as well. Using this technique, variable regions in the *N. bombi* genome can be compared so the population structure and transmission patterns of this microsporidian parasite can be determined—and perhaps confirm/eliminate the theory of a 'rogue' *Nosema* strain responsible for precipitous decline of some bumble bee species.

In addition to *Nosema*, bumble bees are hosts to whole communities of parasites and pathogens. The tracheal mite *Locustacarus buchneri* (Stammer) can reach high levels, but in southwest Canada, was found to have a relatively narrow host range (Otterstatter and Whidden 2004). Larvae of parasitic conopid flies develop in the adult, and *Crithidia bombi* is a common flagellate parasite of the gut that (at least in European *Bombus*) has a wide host range. In a survey of *Crithidia bombi* infections of eastern North American *Bombus,* we observed high variation in infection prevalence, by site and species. Of the 602 *B. impatiens* we collected in 2009, only 10% were found to be infected with *C. bombi* (Table 1). Infection

A pollen-loaded bumble bee foraging on cranberry flowers. Cranberry is more efficiently pollinated when the flowers are 'buzz pollinated,' and this is commonly done by bumble bees. They move their flight muscles rapidly and vibrate the flower, which releases pollen. (photo by A. Averill)

2009	
Bombus species	% infected (n)
affinis	0 (1)
ashtoni	0 (1)
bimaculatus	40 (81)
citrinus	9 (11)
griseocollis	10 (29)
impatiens	10 (602)
perplexus	22 (37)
ternarius	83 (6)
terricola	100 (1)
vagans	75 (32)

Table 1. Number and species of Bombus collected during 2009 and percent infected with *Crithidia bombi*, a flagellate parasite of the gut.

	Bombus species										
Site	*bimaculatus*	*citrinus*	*fervidus*	*griseocollis*	*impatiens*	*pensylvanicus*	*perplexus*	*ternarius*	*terricola*	*vagans*	%
	Percent infected (n)										site
Belchertown	*100 (1)*				*0 (1)*		*100 (2)*	*100 (1)*		*66.7 (3)*	75.0
Amherst	*0 (1)*			*100 (2)*	*96.2 (26)*	*100 (1)*				*100 (1)*	93.3
North Wareham					*0 (1)*					*70.6 (17)*	66.7
Chatham			*100 (1)*		*47.4 (19)*						50.0
Plymouth					*33.3 (30)*						33.3
PA CAP	*92.1 (25)*				*60.0 (5)*		*100 (4)*			*100 (2)*	86.9
ME CAP	*88.9 (9)*	*100 (1)*		*50.0 (2)*	*71.4 (7)*		*100 (2)*	*80.0 (5)*	*100 (1)*	*77.8 (9)*	78.4

Table 2. *Crithidia bombi* infected bumble bees collected during the summer of 2009. All collection sites were in Massachusetts, with the exception of the Pennsylvania and Maine CAP apiary site.

prevalence also varied greatly by site, and each site varied in its composition of bumble bee species (Table 2).

Other undescribed parasite species, especially those that are single-celled and difficult to distinguish morphologically, will likely emerge using molecular techniques. A new species of *Crithidia* has just been proposed (Schmid-Hempel and Tognazzo 2010). Once described, a key piece of information that is needed is whether each of our bumble bee species is equally at risk for infection (i.e. what is the 'host range' of a given parasite?). In fact, even for known parasites, host range studies have been done almost entirely on European bumble bee species, which differ from those in North America.

Bumble bees have previously been found to be infected with known honey bee pathogens. Using molecular diagnostic techniques designed for honey bees, bumble bees have tested positive for acute bee paralysis virus (ABPV), deformed wing virus (DWV), and kashmir bee virus (KBV) (Meeus et al. 2010). *Nosema ceranae* infected bumble bees have been reported from two *Bombus* species native to South America (Plischuk et al. 2009).

Non-lethal sampling of endangered bumble bee populations

We have located a few isolated areas that harbor populations of the endangered *B. affinis* and *B. terricola* in our surveys of Northeast US. It has been a dreadful feeling to find these few rare bees as we sort collections. Thus, to carry out pathogen analysis for *Bombus* in these areas, we are looking at non-lethal sampling for PCR-based methods for the detection of gut-infecting parasites in the feces of bumble bees. *Nosema bombi* and *Crithidia bombi* cells are shed into the gut and can be detected in fecal samples using microscopy (Otterstatter and Thompson 2006). Deformed wing virus (DWV) and black queen cell virus (BQCV) are two gut-infecting honey bee viruses that have been shown to be reliably detectable in honey bee feces using reverse transcriptase PCR (Chen et al. 2006). We have been able to detect at least one DWV-like virus in samples of feces from commercial bumble bees. Provided that gut cells of the insect are also shed into the feces, this method will provide a means of collecting genetic information about the population of bees being studied including the possibility of accurately identifying the species of individual bees.

What do we know about *Bombus* pathogens in managed non-*Apis*?

We are planning to begin a survey of parasites in commercially-available *Bombus*. Several pathogens that can be found in wild *Bombus* can also be found in commercial colonies. In our preliminary studies of colonies from two commercial vendors, using PCR-based methods, we have been able to detect *N. bombi*, *C. bombi,* and *L. buchneri*. We have also found what appear to be the honey bee viruses DWV and BQCV.

Pathogen 'spillover' from honey bee colonies to wild bees

Managed Pollinator CAP cooperating researchers initiated a four-year project wherein 30 honey bee colonies were established in each of seven states. Collections of *Bombus* were made in 2009 and 2010 around some (ME, MN, PA) of these apiaries and forwarded to us at U Mass where we are analyzing them for pathogens. At the Maine CAP site in 2010 (Table 3), 87.5% of honey bees and 26.3% of other kinds of bees (excluding *Bombus*) collected during blueberry bloom reacted positively to DWV specific probes. Post bloom, 9.3% of bumble bees collected at this same site tested positive using these probes. While the same number and proportion of honey bees reacted positively to BQCV probes as DWV, 12 of 16 of these bees reacted positively to

		% reacting to probe			
		parasite			
	n	DWV	BQCV	SBV	*N.* [illegible]
Apis	16	87.5	87.5	6.3	88.2
Bombus	86	9.3	20.9	0.0	26.7
Other bees	19	26.3	36.8	0.0	15.8

Table 3. Percent of bees reacting positively to parasite-specific probes for three viruses and *Nosema ceranae*, RNA and DNA were isolated from gut tissue of individual bees collected while foraging near the Maine CAP apiary in 2010.

***Rare Bombus terricola* (male) (yellowbanded bumble bee) collected near Maine CAP Stationary Apiary site. This was previously a common species whose populations recently collapsed in the Northeast. (photo A. Morkeski)**

both probes. Higher percentages of both bumble bees and other bees reacted positively to BQCV probes than DWV. No bumble bees or other bees reacted positively with sacbrood virus (SBV) probes. A single honey bee produced a SBV positive and this bee also tested positive for DWV and BQCV. Using these same probes for DWV, the 2009 bumble bee collection from the Minnesota CAP apiary did not test positive, but using a set of DWV probes that target a more highly conserved gene revealed that 17.6 % of bumble bees reacted positively. When analyzed further, it was determined that the RNA sequences of this gene were between a 96-98% match to a Pennsylvania CAP apiary DWV isolate.

It is possible that by using probes that target other regions in the genomes of these viruses, these results would be altered, especially in the case of DWV. However, without sequencing multiple regions in the genomes of these viruses, we cannot be certain that they are identical to those infecting honey bees and that they are indeed shared between diverse bee species. It is possible that the probes that are designed to detect honey bee pathogens are reacting positively with parasites that are only closely related to those found in *A. mellifera*. Similarly, other bees may react positively with *N. cera*nae probes if they are infected with a closely related microsporidian parasite.

No 2009 bumble bees collected around CAP apiaries tested positive using *N. ceranae* PCR probes, but all collections tested positive when using probes specific for both *N. ceranae* and *N. bombi*. In the 2010 collection from the Maine CAP apiary, 88.2% of honey bees collected while foraging alongside native bees tested positive using *N. ceranae* probes. Using the same probes, 26.7% of bumble bees tested positive as well as 15.8% of other bees. By comparison, 39.5% of bumble bees reacted positively when using probes that detect either *N. bombi* or *N. ceranae,* but only 10.5% of other non-*Apis* bees tested positive when using the *bombi/ceranae* specific probes.

While there are a number of reports of

bumble bees infected with known honey bee pathogens, we will not know the impact of such infections on populations of native bees if we do not know the host range of these parasites and whether the parasites we are detecting are in fact the same.

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Honeyville Offers Specialty Treats From

by CECIL HICKS

"The Land of Elk and Honey™"

Honeyville, has been in operation since 1918 and is located ten miles north of Durango, Colorado, off of Highway 550 in the Animas River Valley.

Elk! Just the sound of the name alone stirs up visions of a majestic large game animal strutting across a high-mountain meadow in the Rocky Mountains of Colorado. This is the view from Honeyville (located near Durango population 16,000) which is quite possibly the oldest and largest family-owned specialty honey manufacturer in Southwestern Colorado.

In a state with elk herds totaling some 300,000 plus, it's no wonder that orange-clad hunters descend in droves during big game hunting season on national forested lands, and private farm and ranch lands of the region. Thus, Honeyville uses the slogan from "The Land of Elk and Honey™."

The Four Corners Region (where the states of Colorado, Arizona, New Mexico and Utah intersect) offers a wide variety of habitat ranging from high mountain alpine meadows, mesas and basin desert land strewn with sagebrush. While the area has numerous tree stands of pine, fir and aspen, pinion and juniper are the predominant species. The mountains are tall with several regional road passes higher than 10,000 feet in elevation.

It is in these mountain valleys that bee yards are located so the bees can gather some high altitude nectar from wildflowers. Honeyville's altitude is well over 6,500 feet.

Weather is a key ingredient for a successful high mountain honey season for area beekeepers. When Mother Nature behaves herself, the bees work hard and the honey flows, but if she doesn't, bees and beekeepers alike have problems. A snowy winter will produce an abundance of mountain

(l) More than 200,000 visitors a year to southwestern Colorado ride the popular Durango & Silverton Narrow Gage Railroad during the summer. The train travels to the mining town of Silverton located 50 miles up the track in a high mountain valley. The route of the rail line runs just behind their Honeyville property and many of these same tourists will later visit their store to purchase a sweet souvenir of their vacation. (r) Colorado is known for being the elk capital of the United States with herds totaling some 300,000 plus animals.

Honeyville is located in the shadows of the scenic San Juan Mountain Range. There's plenty of customer parking and the store hours are 8:00 a.m. to 6:00 p.m.

Welcome to Honeyville and "The Land of Elk & Honey™."

wildflowers in late spring and summer rainstorms will help continue their blooms.

The Culhane family, consisting of Danny, his wife Sheree, and their son Kevin, have been successfully running Honeyville since becoming its owners in 1986. According to Danny, the purchase was actually a merger as the Culhane's had been beekeepers managing some 3,500 beehives and selling bulk honey, along with bottling specialty honeys and jellies, to Honeyville for many years prior to buying the business.

It was Danny Culhane's father, Vernon, who began creating specialty honey mixes and blends in 1925, which was also the first year he started raising honey bees near Durango with 200 hives. For years Vernon sold honey to local grocery stores and peddled his wildflower honey to local customers from the back of his flatbed truck.

Danny said it (managing Honeyville) was, "a match made in heaven," as the two businesses (beekeeping and honey specialty sales) complemented each other with various family recipes all using pure mountain Wildflower Honey as one of the ingredients.

Danny began working bees at a very young age as he tagged along with his father in the bee yards. He claims it was actually, "by osmosis" that he learned beekeeping skills hands-on, as well as becoming involved with honey extraction and filling of barrels for storage.

Danny became a second-generation beekeeper when he took over raising the family bees from his dad in 1974. Following graduation from high school, he attended five years of college at Fort Lewis College in Durango where he majored in Political Science and History. After earning a Bachelor's Degree, he chose becoming a beekeeper instead of seeking other career endeavors. A year later he married Sheree and she has been involved with their honey business ever since. Sheree was raised in California and later worked as a LPN (Licensed Practical Nurse).

Today, Honeyville remains a family-owned operation with Danny in charge of operations; Sheree overseeing catalog design and new product introduction, and Kevin as plant manager. Their web site is **www.honeyvillecolorado.com** and customer telephone number is (800) 676-7690.

Honey is purchased by the barrel from most of the area's commercial beekeepers and a staff of eight to nine workers are kept busy either with customer sales, shipping orders, or working the bottling line. From the retail sales room, customers can watch the production room in operation (Monday through Friday) through a viewing window. Hours are 8:00 a.m. to 6:00 p.m. in the summer and 9:00 a.m. to 5:00 p.m. during the colder months.

When customers visit the factory store, children and adults alike enjoy the opportunity to watch bees make honey in an enclosed glassed-in observation beehive. Customers may also taste samples of a variety of their products on display. They also

Danny Culhane stands alongside shelves of honey specialty products that are ready to ship to customers.

One of their more popular sales items is Cinnamon flavored Whipped Wildflower Honey.

Danny Price, 11, from Payson, Arizona, checks out the observation beehive in Honeyville's retail store while his dad Ed shops for some honey products. While on family vacation to Colorado each summer, the Price family has been stopping in Durango to buy honey on their drive home for more than 20 years.

The Culhane family (L - R, Sheree, Danny and Kevin), owners of Honeyville since 1986, stand by one of their honey product displays in their retail store.

sell a Honey Wine that's bottled locally.

The Culhanes are pleased to see first time and returning customers leave with armloads of Honeyville products. For example, on June 21, 2010, Ed Price and his 11 year-old-son Kevin from Payson, Arizona, were in the store making annual purchases of honey products. Ed said he's been buying honey at Honeyville for the past twenty years. "We always stop in on the way home after our annual camping trip to Silverton."

Danny explained, that often while customers are shopping in their store and they hear a passenger train whistle, they will run outside to view the renowned Durango Silverton Narrow Gage Railroad as it rolls by and begins its uphill journey to Silverton located 50 miles into the San Juan Mountains from Durango. The route of the railroad line is located near their property.

This steam-driven historic train attracts some 200,000 riders during the year. This is the same 1880 era railroad train used in scenes filmed in Colorado of the 1960's Paul Newman and Robert Redford classic cowboy movie "Butch Cassidy and the Sundance Kid." First-time honey customers often visit Honeyville after riding the train and remembering the Honey Hut beside the tracks with a large arrow pointing to the store and advertising "Honey For Sale."

Danny explained "You'd be surprised how many first-time customers come in our store to purchase honey as a souvenir of their vacation and tell us they saw our Honeyville sign on the side of the railroad tracks and had to check us out."

Danny said their best selling item is "Cinnamon Whipped Honey," a thick blend of honey and freshly ground cinnamon. They also make other varieties of whipped honey flavors including bumbleberry, blueberry, blackberry, and raspberry.

Danny said that the store was even once featured on a television segment of the Food Channel in 2002 on a program called "Food Find."

As for a hobby, the Culhanes are big-time boaters and both Danny and Sherree own a boat and Kevin likewise. As time permits, they boat Navajo Lake (which is located just across the border in New Mexico) on family outings, or individually. Also each summer they manage to make an annual family boating trip to Lake Powell on the Colorado River for a little R & R.

Both local residents and out-of-town visitors are attracted to Honeyville where they can browse the displays, taste some Rocky Mountain Wild Flower honey products, view a working beehive and watch workers at the honey bottling production line. As customers depart with their specialty honey purchases, they are encouraged by staff members and the Culhane family alike, to have a good day and hopefully sometime in the future they will return again to "The Land Of Elk and Honey™."

New Zealand Beekeeping Conference

by KIRSTEN TRAYNOR

Photos by MICHAEL TRAYNOR

This June, my husband, Michael, and I left behind the hot, dry summer of Arizona for the shores of New Zealand. As our plane zipped from LA to Auckland overnight, we crossed the equator and jumped from the summer desert into a cold, damp winter. Our plane arrived early in Auckland's international airport. At five in the morning, the austere white halls echoed with the murmurs of a skeleton crew preparing for the frenzied crowds that would soon swarm in. We sipped a cup of hot chai, waiting for the car rental offices to open. While we had known it would be winter and dressed accordingly, it had slipped our minds that the days would be substantially shorter and the sun would not rise for almost two hours.

According to the Maori, the land they inhabit is *Aotearoa*, the land of the long white cloud. About the size of the state of Colorado, New Zealand is home to 4 million individuals, with 1.3 million living in and around Auckland. This leaves vast stretches of open land for agriculture, forest and national parks.

According to Maori legend, the demi-god Maui went fishing with his brothers. When they were far out at sea, Maui dropped his fishhook over the side of his waka, a traditional Maori canoe. He felt a strong tug, much stronger than any fish, so he asked his two brothers to help him reel in the catch. After much straining and pulling, suddenly surfaced *Te Ika a Maui*, the fish of Maui—the North Island, while the South Island is called *Te Waka a Maui*, the waka of Maui.

The majority of beekeepers live on the North Island. In the last 20 years, as the price of manuka honey soared, newcomers poured into commercial beekeeping, lured by the high profits of manuka honey—worth $60 million NZ dollars annually in exports alone. The country currently has 375,000 registered hives.

For a long time the two islands remained varroa mite free, but the mite was first detected on the North Island in 2000. The lower parts of South Island are just now experiencing their first wave of varroa, which hopped islands in 2006. Until the arrival of the mite, many South Island beekeepers managed their hives organically. But with hives crashing in tremendous numbers, most of these organic beekeepers are turning to miticides to keep the levels in check.

The prized manuka honey with high levels of antibacterial activity sought by many Asian and European consumers is predominantly produced in the North Island. Manuka and its close relative, kanuka, flower on the South Island, but the honey typically lacks the non-peroxide antibacterial properties. Yet, it still sells at a premium price, since most consumers outside of New Zealand don't understand the difference.

Packers outside of New Zealand, keen to bulk up profits, may also cut the manuka honey with a non-manuka source. The global market currently sells much more honey marketed as New Zealand manuka than the country can produce.

Back in the early '80s the New Zealand honey industry looked very different. Beekeepers couldn't sell the bitter-tasting

Glenn Kelly, member of the Nelson Branch of the National Beekeepers Association of New Zealand welcomes attendees to the 2010 conference in coastal Nelson. His keen sense of humor helped set the tone for the conference. Although not pictured, Kerry Gentleman and Frazer Wilson, who together run a commercial operation of 450 hives in Golden Bay, ensured the success of the conference, organizing the event and making sure everything ran smoothly.

(l) For most of the talks, attendance was so high that some members stood along the walls. Many had traveled long distances to attend the conference. (r) Conference attendees crowd into the reception area of the Rutherford Hotel in Nelson.

(l) Stu Ferguson of the Hive Doctor demonstrates his newly designed hive bottom board. His design won best invention at this year's conference. Unlike other mesh screened bottom boards, it allows less air in, so the brood isn't chilled, while still ensuring mites drop down. Attachable mite monitoring trays snap in below. Onto the front a beekeeper can pop on three different tags that come in a variety of colors and shapes to give each hive a unique entrance. The same design could be used as a marking system by the beekeeper, letting him know which hives need attention upon a return to the apiary. The bottom board has a built in adjustable entrance that can be closed off for transport, open to a small bee space for winter or open wide, depending on how the brood box is aligned on top. (r) Steve Lyttle and Carolyn Ball of 100% Pure New Zealand Honey, a honey packing company that just recently rebranded itself. They operate out of Timaru on the South Island, exporting manuka and other NZ honeys internationally. They had to fight legally for the right to use their new name, but the new sleek look has met with approval from their customers.

manuka honey except as bee feed to other beekeepers. It commanded a minimal price and most beekeepers tried to avoid producing the gelatinous, thixotropic honey that was difficult to extract.

What changed the industry so drastically? And where is the New Zealand honey industry moving in the future? Both of these topics were fiercely debated at the annual conference of the National Beekeeper's Association of New Zealand, which took place in Nelson on the northern tip of the South Island from the 27th - 30th of June, 2010.

Beekeeping has enthralled New Zealanders since the earliest bees arrived in skep hives, brought by English missionaries in 1839. Resourceful settlers enjoyed keeping bees. Within nine years, an enterprising New Zealander published the country's first book on beekeeping. The European black bee was the original import, but by the 1880's gentler Italian stock arrived along with Langstroth style hives and American Foulbrood (AFB). To this day, New Zealand has an aggressive no-tolerance policy against AFB. Antibiotics are illegal and hives must be destroyed within 7 days of confirming AFB. Beekeepers must receive training in AFB recognition. They are then required by law to sign a Disease Elimination Conformity Agreement (DECA). The DECA outlines a beekeeper's personal plan on how he/she will eliminate AFB from his/her colonies. Those who have not received AFB recognition training may have an approved beekeeper inspect their hives and then file a Certificate of Inspection. Those failing to do so will have their hives inspected by a contractor authorized by the disease Management Agency and the beekeeper will be liable for the cost of inspection. The goal of the program is to eradicate AFB in New Zealand. Since imports of bees are forbidden, they believe complete elimination is possible. Until varroa arrived, the rate of AFB had declined steadily to a low of less than 1 percent. With beekeepers struggling to keep hives alive since the arrival of varroa, the AFB rate has climbed.

Just like in the U.S., there has been a surge of new hobby beekeepers keeping hives in the last few years. To help these newcomers succeed, the conference added on a hobbyist beekeeper's forum last year. This full day program addresses the needs and concerns of small beekeepers. It included an informative introduction to maintaining a hive by David Woodward, head of the Apiculture Department at Telford Rural Polytechnic, the National Training Institute for Apiculture in New Zealand. The institute offers practical courses in beekeeping and queen rearing. The 37 week course includes information on: hive management, a first aid certificate, hive equipment, entomology, bee behavior, engine maintenance, honey production, agrichemicals, business administration, pollination, queen bee studies, and bee diseases. For residents, the course costs $3,190 NZ. (**http://www.telford.ac.nz/Courses/Apiculture.htm**)

David Woodward demonstrated the different parts of a typical hive. While New Zealand hives are very similar to the Langstroth hives used in the U.S., the top covers are different. Most beekeepers use a galvanized tin roof that slips over the hive body.

The hobby day continued with Carol Downer, the former president of the Auckland Beekeepers Club explaining how hobbyists benefit from joining an active club, where like-minded individuals share their passion for keeping bees.

I then presented information on easy varroa management, explaining how to use the biology of the bee against the biology of the mite. The audience responded enthusiastically, asking insightful questions. Due for lunch at the nearby Prince Albert Hotel, we strolled over as a group, enjoying the mild winter weather in sunny, coastal Nelson.

Lunch was a delight. The menu had been arranged with the help of Maureen Maxwell, a former chef who started a successful premium artisan honey production company. Each dish used a different New Zealand honey, highlighting the variety of flavors produced from the unique New Zealand flora. During lunch Maureen regaled us with stories of honey's long history. After lunch the hobbyist day continued with information on beekeeping regulations, apitherapy, and homemade skin care products.

The day ended with a mix and mingle in the conference hotel's cafe, where long-time friends and associates caught up. We had spent the previous three weeks traveling from the North Island through the South Island, meeting with beekeepers along the way. Many beekeepers attend the annual conference, which is hosted by a different regional beekeeping association each year. Usually the beekeepers make the trek into a small winter holiday, so everyone was in a festive mood.

The main conference opened early the next morning with a review of the standard for the toxic honey Tutin. While bees don't collect nectar from the tutu plant (*Coriaria*

arborea), a vine-hopper insect (*Scolypopa australis*) feeds on the sap and excretes honeydew tainted with the lethal toxin tutin. Beekeepers have long known to avoid stands of tutu with their hives after December 31st. A new hobby beekeeper, unaware of the risk, sold contaminated comb honey at a farmer's market in 2008, causing 22 people to fall seriously ill. Unfortunately, the toxic honey can not be distinguished from normal honey by taste, smell or sight. Beekeepers on the North Island, especially in the Coromandel Peninsula and Eastern Bay of Plenty, must typically have their honey tested for the toxin, while beekeepers on the South Island, outside of the Marlborough region, are considered to be in a low risk zone.

My husband Michael next presented a photographic journey of our travels through apiaries and research institutes in Europe. His talk included over 100 photographs depicting beekeeping, bee forage, bee breeding and bee diseases. To view a small selection of his images, please visit: **www.flowerslovebees.com**.

A common theme that ran through the conference was where the NZ beekeeping industry was headed in the future. Many had done very well with the surge in demand for manuka honey. Whenever profits are high, resentment grows too, as individual large players stake out their own territory. Part of the upset is due to the lack of a manuka standard, with many beekeepers on the North Island wanting only active non-peroxide antibacterial honey classified as manuka. This naturally doesn't reside well with the beekeepers on the South Island, who have long produced a high quality, organic manuka table honey.

But how did such a small country come to dominate the medical grade honey business? According to third-generation honey packer Peter Bray of Airborne Honey, which celebrated its 100th anniversary this year, part of the success is due to smart marketing driven by research. This research and marketing was funded by a small hive levy (tax) on all managed beehives. The levy lasted for seven years, before restructuring of the beekeeping association occurred and the levy was abolished, leaving the industry without a renewable source of marketing and research funds. During those seven years they spent $600,000 NZ, which helped to create today's $60 million NZ manuka export market. Peter Bray and many others would like to see a return of a small hive levy.

While manuka has garnered the spotlight for many years, NZ produces a wide variety of distinctive honeys: including rata, kamahi, rewarewa, tawari and red beech honeydew, plus the more common clover, thyme and vipers bugloss. Research funded by Comvita, a producer of natural healthcare products with a bee focus and the largest exporter of NZ manuka honey, has shown that some of these other honeys also have medicinal value. While the manuka has the high antibacterial properties, they have found that the kanuka is excellent for promoting wound healing. According to many of the beekeepers we spoke with, these two plants that look very similar flower predominantly at different times on the North Island, but simultaneously on the South Island. The news that kanuka promotes wound healing is thus welcomed by South Island beekeepers, as it has the potential to raise the value of their manuka/kanuka blend.

Many large manuka honey producers are keen to keep reaping profits from this single product. Some feel a similar market could be created for the other unique honeys NZ produces, expanding NZ exports even further. To do so would require a new infusion of research and marketing funds, possibly through the reinstatement of a hive levy. Beekeepers around the world tend to dislike hive taxes, preferring to wholesale their honey to a packer or develop their own market branding. It is hard to convince a group of highly independent entrepreneurs, who are used to figuring it out on their own, to invest collectively in a project that could also benefit their competitors.

However, NZ has demonstrated that by investing a small amount of funds into research and marketing, they can create a new niche product sought out around the world. Instead of competing with one another, there is so much demand for manuka that no beekeeper has trouble selling their stores. Other countries could follow New Zealand's lead and invest in developing niche markets for their varietal honey. The olive oil and the maple syrup industries have managed to raise the value of a premium product, yet in most of the world the price of honey still languishes behind. Instead of trying to compete with other honey producers, perhaps we should unite to raise the market standard for everyone, so that beekeepers can earn a living wage.

We met with many individuals involved in the New Zealand beekeeping industry, including large honey packers, small queen breeders, commercial organic beekeepers, some of the manuka honey pioneers and bee researchers. Beekeepers and scientists invited us into their homes and shared their personal experiences with us. The people we met were warm, engaging and excited about the future of NZ beekeeping. We will be publishing more about how the manuka industry evolved, where NZ beekeeping is headed and some of the interesting bee research done in New Zealand in the next several months, accompanied by detailed photographs depicting the flora and specialized equipment developed to take advantage of the manuka flow.

A Bee Garden to Behold

The winning design in a competition funded by Häagen-Dazs for the bee garden at the Harry H. Laidlaw Jr. Honey Bee Research Facility, U.C. Davis. It encompasses diverse smaller gardens that tell the story of bee pollination and well being. Drawing by Chika Kurotaki

BY M.E.A. McNEIL[1]
PHOTOS BY KATHY KEATLEY GARVEY[2]

On a warm fall California day, a half acre garden was bursting with bloom and, over the afternoon, 1,300 people come to celebrate its opening. They wandered along paths named Langstroth Lane and Waggle Dance Way – funders, designers, organizers, volunteers – together with a curious public. They mingled with those it was created for, the bees that buzzed unconcernedly about them.

Children romped the paths, gardeners noted the bee-friendly plants, researchers gave talks and tours to ice cream savoring visitors.

Honey Bee Haven, at the U.C. Davis Harry Laidlaw Bee Research Facility, was created through an ingenious collaboration of commercial, academic, professional, and bee-loving interests. It is an educational and demonstration garden, designed to tell an unfolding story about the bees.

The location of such a garden at Davis is in keeping with its mission as a land grant university. A 19th century law provided for federal land to be granted to states for the development of institutions to teach agriculture, science and engineering rather than traditional classical studies. The Laidlaw facility was established in 1932 for the study of bee biology and health, in large part to meet the needs of California's agricultural industry. It houses labs, a classroom, observation hives and offices for bee breeders, geneticists, pollinator specialists and bee stock managers. It is also home to some 70 honey bee colonies.

With a third of American colonies collapsing each year, public awareness has been awakened to the value of honey bees. Among the calls to action is a campaign by the ice cream maker Häagen-Dazs, whose ingredients in large part rely on bee pollination. The company pledged $500,000 for honey bee research in 2008-09, shared by UC Davis and Pennsylvania State University. It distributed over a million packets of bee-attracting wildflower seeds and committed $125,000 to the U.C. Davis Department of Entomology for a bee garden project. At the garden opening, Dori Sera Bailey of Häagen-Dazs announced a new $50,000 grant — and ice cream for everyone.

In Davis, there is little or no rain from July through October, and summer temperatures reach 100°F. Bees there endure seasonal food shortages and unreliable variety in their floral diet. The idea of a demonstration garden with multi-season forage came to Lynn Kimsey, director of the U.C. Davis Bohart Museum of Entomology, when meeting with Häagen-Dazs.

All of this was taking shape as Jessica Brainard bought a container of Häagen-Dazs Vanilla Honey Bee ice cream to soothe a broken heart. She whiled away the time at a laundromat reading the carton. Brainard, who works with science exhibits such as the Monterey Bay Aquarium, checked out the ice cream maker's educational website. When a contest to design a bee garden was announced there, it seemed a perfect project for Brainard and a friend, landscape architect Donald Sibbett, who had designed many learning environments for sites such as the Yosemite National Institute. He completed the team with exhibit designer Chika Kurotaki and landscape architect Ann Baker.

The competition, coordinated by Melissa Borel at the University's California Center for Urban Horticulture, had demanding requirements. Among them were: to plant for the unique climate and soil conditions, eliminate chemical pesticides and fertilizers, collect and ration water, recycle plant debris on site, and keep a prolonged bloom.

Brainard, Sibbett, Kurotaki and Baker had just a month to come up with their entry. "We four were a good team," said Brainard. "It was such a short deadline and pro bono. We respected each other's expertise. It was a collaborative process, a great experience for all of us. We were all in the flow."

Baker added, "It was non-hierarchical,

An ad hoc Bay Area team with complementary expertise came together to craft the winning design in the Häagen-Dazs competition for the Honey Bee Haven garden design at U.C. Davis. They are, from left, designer Chika Kurotaki, landscape architect Ann Baker, exhibit designer Jessica Brainard, and learning environment and landscape architect Donald Sibbett. Photo by Donald Sibbett

1 M.E.A. McNeil is a writer and Master Beekeeper.
2 Kathy Keatley Garvey is an award-winning photographer and journalist at U.C. Davis. A long-time agriculturist, she is co-author of a book on aquatic pests.

we all had an equal role; there was no attachment to 'my idea'. We had the right pieces, the expertise and the experience. We focused on what people could do."

The group started by brainstorming a story line based on Brainard's bee research. Their idea was to tell what honey bees do, why they are in trouble and how the visitor can respond. Sibbett took the role of project manager, keeping things moving and adding ideas such as creative names. They came up with a series of separate gardens within the garden, connected by a series of trails — all thematic parts of the storyline.

Foragers at the Davis bee garden, clockwise from top left, on sage, red clover, lupine, coriopsis. Photos by Kathy Keatley Garvey

Each garden represents a different environment for bees: pollination of flower gardens, food production, home plots.

The group collaborated on a site plan to be built on a $60,000 budget. Baker worked out specific plantings to meet the challenge of providing continuous flowering in the hot, dry summers up to the frosty, wet winters. She created a list of low-maintenance native California and Mediterranean pollinator plants – coming up with 40, mostly perennials with a few biennials.[1] She grouped them in hydro-zones (plants with similar water requirements), created berms for those requiring drainage, and added ground covers to conserve water. She plotted a small orchard to bloom in the order that it does in the Central Valley. Each choice was made to carry the story forward. Kurotaki designed the final graphic presentation with crisp hexagonal bee patterns.[2]

"We had so many wonderful garden concepts submitted that making the final choice was really difficult," said Kimsey, who looked on the visitor-filled garden with delight and no small measure of incredulity. She was one of eight judges; they narrowed 32 international entries from firms and students down to six.[3] They then focused on diversity, creativity, teaching value, cost and attention to detail. They finally made a unanimous selection, finding, Kimsey said, that "the winning design fits beautifully with the campus mission of education and outreach." When a UPS truck pulled up in front of Sibbett's house with a delivery of Häagen-Dazs ice cream, he knew they had won.

Then the work of clearing the land and preparing the dry, compacted soil began. "It was like a brick," said Borel. The field was ripped, tested, and amended. After the Haagen-Dazs contribution, she said, "Many local companies followed suit by donating materials such as compost, pavers, plants and irrigation supplies. They were in it for the bees."

Their plans long turned over to the University to create, the designers were as curious as the rest of the visitors as they approached the garden at the opening cele-

(l) BEFORE: The bee garden laid out, with Waggle Dance Way leading to the Pollinator Patch. Hard, compacted soil was a challenge to work and amend before planting could begin. (r) AFTER: The garden on opening day from the same view. Photos by Kathy Keatley Garvey

(l) Native pollinator specialist Robbin Thorp, emeritus professor of entomology at UC Davis, and graduate student Emily Bzdyk answer questions from visitors on opening day of Honey Bee Haven. The two center specimen drawers contain species found before and after the garden was built. At left, next to Thorp, is UC Davis graduate student Soledad Villamil. (r) The hands-on six foot long bee sculpture is explored by Ray Hartsough (right) and Kaelen Bryant, both of Davis. The piece was created by Donna Billick of the Art/Science Fusion Program. Photos: Kathy Keatley Garvey

(l) Visitors strolled the Honey Bee Haven garden at its opening in September. It is planted with nearly year-around forage. Sedum blooms in the foreground. (r) When the ice cream company Haagen Dazs met with UC Davis to discuss possible bee projects, Lynn Kimsey (left), director of the Bohart Museum of Entomology and then chair of the department, thought a foragers' garden would be ideal. Here she and Dori Sera Bailey of Haagen Dazs listen to programs on opening day of the garden celebrating the realization of that idea. Photos: Kathy Keatley Garvey

bration in September. Leading up to it is an existing bike path connected to the Campus Buzzway, a quarter acre to be planted with a mixture of poppies, lupines, and coreopsis, chosen by a national vote of University students – another Haagen-Dazs project. The garden can be entered from any side, but a natural beginning to the story is marked by a giant statue of a honey bee at the north entrance flanked by intriguing bee-related ceramic mosaics and stacks of creatively painted supers. Each piece, accessible to exploration by curious hands, was built by teachers or students in a science-art fusion program, led by Donna Billick and Diane Ullman.[4]

The hexagonal opening is the first of four gathering areas that serve as orientation points for guided tours or chats with entomologists. The permeable paths that connect them wind to the right, counterclockwise, which Brainard explained "is typical behavior of people, studied, used in retail." The strolling visitor enters the first of four themed gardens, Honeycomb Hideout. From there, one can go to the centrally located learning center or take Waggle Dance Way through an informal mix of mostly native plants — salvia, coyote bush, sage, butterfly rose. In the Pollinator Patch, on this opening day, apiary assistant Elizabeth Frost explained an observation hive. A hexagonal cast-concrete stone, dripped by the irrigation system to provide a water source for the bees, can be found here as in each of the four sections of the garden.

Meandering flora give way to the agricultural setting of Pollinator Patch, which, in a quadrangle of persimmon trees, tells the story of the pollination of a third of the foods we eat. Langstroth Lane leads to Growers Grove, a garden of raised beds filled with familiar vegetables and herbs. Old almond trees mark a transition to Orchard Alley, a row of fruit trees that symbolizes the bees' importance to agricultural crops. Groundcover in the orchard provides additional food source for the bees.

Save-the-bees Sanctuary is a gathering space between the large-scale agricultural plantings and the small-scale home garden – a place where the visitor can learn more about what can be done about the decline of the bee. The lesson is continued in My Backyard, where one theme is, according to Brainard, "what you can do to replace grass". The native and Mediterranean plants in this garden, selected to attract foraging bees, are arrayed in a palate of greys and greens against the fall blooms. Roman

Native pollinator specialist Neal Williams, assistant professor of entomology at UC Davis, discusses native bees at the garden opening. Photo: Kathy Keatley Garvey

chamomile and dwarf yarrow are low and lawn-like; hollyleaf cherry and toyon serve as hedging; willow and linden trees are filled with seasonal flowers, with willow among the earliest. Such plantings can create valuable hedgerows or habitat corridors between agricultural sites and can be built anywhere — on vacant lots or rooftops. Informative signage offers tips on transforming a space into a bee garden.

In contrast to the groomed gardens, the visitor turns through naturally undulating plantings along Round Dance Circle in the section called Nectar Nook. Diverse clusters of sage, native buckwheat, coyote bush and aster provide pleasure to visitors and nutrition to the honey bees and native bees as well. Blooming in mid-September were: Autumn sage, sedum "Autumn Joy", purple coneflower, hybrid catmint, black-eyed Susan, Santa Barbara daisy. Around the perimeter of these gardens within a garden, are additional native plantings that unify the whole.

The wide variety of trees in the garden — black locust, acacia, Washington hawthorne, Snowy River wattle, as well as persimmon, apple, almond and plum — provide more than nectar and pollen. They moderate the temperature by shading. Baker points out that several cover crops loved by pollinators thrive beneath them, such as clover in the orchard; "A lot of diversity around the trees increases the number of beneficial insects."[5]

Sheridan Miller, 12, of the Bay Area, was named Queen Bee for a Day at the garden opening. She has organized a campaign to raise funds for honey bee research at UC Davis. Photo: Kathy Keatley Garvey

Throughout this day lectures, instructions and chats were offered by the Davis bee biology team: Sue Cobey, bee breeder and teacher; Michelle Flennigan, Häagen-Dazs funded researcher; Kim Fondrk, bee breeder; apiary assistant Frost, Eric Mussen, Extension Apiarist and researcher; Neal Williams and Robbin Thorpe, native bee experts.

To stroll through this work of art and ingenuity is to see the fulfillment of its goals – nearly year-round food sources for bees and other insects, public education about the plight of the bee, guidance for visitors to plant bee-friendly gardens. In addition, it provides an excellent site for University field research, and an educational resource for school groups, recreational visitors, master gardeners, family groups.

The garden is an example of how multi-season food sources for bees can be grown. Mussen emphasizes that the half-acre plot is not large enough to be the sole nutritional source for the facility's bees – a fact that underlines the importance of the project's aim to inspire similar pollinator plots in hedgerows and back yards.

Honey bees are just one of many species of bees that benefit from forage at the garden, as interpretive graphics explain along the way. Native pollinator specialist Robbin Thorpe, U.C. Davis emeritus entomology professor, stood in the midst of the garden, amiably explaining a display of the bees he has found at the site. He began establishing baseline data before the garden was built. At that time, the bees were relying on weedy flowering plants and planted trees such as almond, eucalyptus and walnut. "For the pre-planting period I observed over 40 species of bees," he said, and showed mounted specimens in a display case. "Since the garden was planted in late September 2009, I observed 36 species with an overlap of 21 species from the pre-planting surveys. So the total bee species observed in the area since March 2009 is over 55 and counting." Most of the bees observed are solitary bees that nest in soil, although he reported some cavity nesters and cuckoos. "I expect these numbers, in diversity and abundance, to increase as the garden matures and more bees discover a long-term, stable food resource base." Baker's plan provides spaces with open ground without mulch for ground-nesting bees.

The present garden is a work in progress. A judge for the design competition, Aaron Majors of Cagwin & Dorward Landscape Contractors, appreciated that "the design was scalable", which means that it has elements for possible future development, beyond the current budget. The year-old garden has yet to mature, so Baker's plan to the opening space to play with scale has yet to grow: Giant flowers, like sunflowers, were chosen for the opening area to shrink the human perspective. "I wanted people to feel like a bee," said Baker, to better imagine the garden as a place to find food, water, and shelter. "I wanted the plants to be bountiful, lush, verdant, nectar dripping."

"Part of the design is to add interpretive graphics and cell phone audio tours eventually," she said. Other enhancements would be plant brochures and interactive exhibits, a trellis to mark the transition from meandering flora to the agricultural section, and a straw bale seat wall to offer a place to survey the environment. More interpretive signage throughout the site will provide important information about bees. Langstroth Lane would be bordered by trellises with hexagonal lattice work to create the illusion of walking between frames in a beehive, provide screening for the learning center, and again create a sense of bee scale. Passion flower, jasmine and other flowering vines would cover the lattice and provide additional forage for the bees.

Maintenance of the garden will be economical and environmentally conscious. It will use no insecticides, and herbicides will be either eliminated or limited to organic compounds. Gardening will be done weekly by a volunteer crew.

Honey Bee Haven was created by the cooperation of diverse groups – from Haagen-Dazs; U.C. Davis departments of entomology and horticulture; the ad hoc design group of Brainard, Baker, Sibbett, and Kurotaki; the art-science fusion program; Wells Fargo Bank, which provided funding for the bee sculpture and the opening celebration; and the volunteers who keep up the garden.[6]

Private contributions to support bee research at the Laidlaw lab came to nearly $50,000 in the last year – from individuals, companies and from children. Recognition

Michelle Flennikin, the Haagen-Dazs postdoctoral scholar, explains the activity in a bee observation hive. She is associated with both U.C. Davis and U.C. San Francisco and studies bee viruses. Photo: Kathy Keatley Garvey

was made to 12-year-old Sheridan Miller, whose street corner fund-raising sales earned her the title of Queen Bee for the Day.

"These grassroots efforts supporting honey bees are very encouraging," said Jan Kingsbury, of the College of Agricultural and Environmental Sciences. "People see that colony collapse — and the other challenges affecting the nation's honey bees — is a potential catastrophe and they are taking it upon themselves to do something: raise money, raise awareness, or plant a garden. A lot of people are getting huge satisfaction from knowing that U.C. Davis is here working on the problem, and they will do what they can to help out."[7]

Opening day shone with pleasure. The designers were honored with a plaque and a year of Haagen-Dazs ice cream. "This is the most rewarding project I've been associated with in my career," said Brainard. "The plants themselves tell the story."

"We'll not only be providing a pollen and nectar source…, but we will also be demonstrating the beauty and value of pollinator gardens," said Borel, who conducted tours throughout the day. "My hope is that it will inspire everyone to plant for pollinators."

Footnotes

[1] For a list of the plants in the garden, Google California Center for Urban Horticulture, then search for Honey Bee Haven Plant List. Or go to: http://ccuh.ucdavis.edu/projects/honey-bees/Plant%20List%2005%2019%2009%20-2.xls/view?searchterm=honey+bee+haven+plant+list

[2] The winning design submission is at http://beebiology.ucdavis.edu/HAVEN/honeybeehaven.html. Click on "Sausalito team plan".

[3] In addition to Borel and Kimsey, the panel of judges included: David Fujino, executive director, California Center for Urban Horticulture at U.C. Davis; Aaron Majors of Cagwin & Dorward Landscape Contractors; Diane McIntyre, senior public relations manager, Häagen-Dazs ice cream; Heath Schenker, professor of environmental design, U.C. Davis; Jacob Voit, sustainability manager and construction project manager, Cagwin and Dorward Landscape Contractors; and Kathy Keatley Garvey, communications specialist, U.C. Davis Department of Entomology

[4] For information about the Art/Science Fusion Program: artsciencefusion.ucdavis.edu.

[5] For two excellent lists of bee foraging plants, see http://beebiology.ucdavis.edu/HAVEN/honeybeehaven.html. Click on "Sausalito team plan"; see page 13. At the same site, click on "Bee garden design competition parameters"; see pages 6-8.

[6] The event was organized by Chris Akins, Missy Borel, Eric Rohr, Garry Pearson and Tabatha Yang.

[7] To support Honey Bee Haven and bee research at U.C. Davis, contact Jan Kingsbury, College of agriculture and environmental sciences, UC Davis, 1 Shields Ave., Davis, CA, 95616, telephone (530) 304 - 4327, JKingsbury@UCDavis.edu.

(l) A national survey among college students, sponsored by Häagen-Dazs, selected the three bee-friendly plants for the U.C.Davis Buzzway – an area adjacent to the bee garden connected to a bike path. Garry Pearson, Plant Sciences greenhouse manager, puts up banners for the favored flowers – from left, lupine, coreopsis and poppy. (r) Extension apiculturist Eric Mussen (far left), member of the UC Davis Department of Entomology, chats with Brian Fishback of Wilton, president of the Sacramento Area Beekeepers' Association, and Annie Bisbee of Concord, a three-year beekeeper who has five hives. Photos: Kathy Keatley Garvey

The Other Side of BEEKEEPING

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The Apiaceae Continued

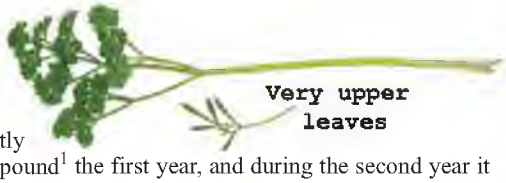
Parsley

Scientific name: *Petroselinum crispum*

Synonyms: *Apium petroselinum*, *Carum petroselinum*, *Petroselinum hortense*, *Petroselinum sativum*, *Petroselinum vulgare*

Origin: Probably Europe, most likely from the Mediterranean region.

Plant description: In many ways parsley is similar to carrot. It is usually a biennial and when grown for seed forms a dense rosette of leaves that are frequently ternately decompound[1] the first year, and during the second year it develops a 3 to 6 ft stem with umbels that are similar to, but smaller than those of carrot. The flowers within the umbels are quite small and yellowish to greenish yellow. The individual flowers are bisexual with five greenish-yellow petals, five stamens, two styles and a two-celled ovary, with each capable of producing a single seed. The nectar is reported to be secreted by a disk-like structure on the top of the ovary.



Parsley is frequently divided into three varieties. The variety *crispum* (the typical variety) has fibrous roots, and the leaf segments are curled and crisped[2]. The variety *neapolitanum* (Italian parsley) has fibrous roots and the leaf segments are flat (not crisped) and look much like the leaves of common celery. The variety *tuberosum* (turnip-rooted parsley) is grown for its edible parsnip-like root. Its leaf segments are flattened, not crisped.[7 &10]

Distribution: See also below under 'Importance as a honey plant'.

Blooming period: Burgett et al.[3] supply a blooming date for parsley in Oregon as late June through July.

Importance as a honey plant: Whereas Oertel[12] did not report parsley a being an important honey plant, Ayers and Harman[2] found it to be of some importance in Oregon, and that the species provided an opportunity for commercial pollination there. According to Bur-

Petroselinum crispum **(parsley) inflorescence. Top: Whole umbel; Bottom: single subumbel. Photos taken 6/24/2010 in Author's home garden. Size bar appropriate only for top photo.**

[1] **Ternately decompounds: a leaf that is three-times compound, i.e. each leaflet forms two leaflets, and each of these form a set of leaflets, which again form a third set of leaflets.**

[2] **Crisped: Curled wavy and crinkled.**

gett et al.[3], its primary area of cultivation there is in western Oregon, as for example, the Willamette Valley, which lies between the Coastal Range and Cascade Range. They also report the species to be very attractive to honey bees.

Honey potential: Burgett[4] found the nectar sugar concentration of the honey stomach contents of bees foraging parsley to be 54.5 %, indicating that the nectar of parsley is a rich resource for honey bees.

Warakomska et al.[17] estimated that the parsley flower produced 0.2 mg of sugar and that the honey potential of commercial parsley plantings was 62.4 and 160 kg/ha (55.6 and 142.6 lbs/acre) during 1978 and 1979, respectively.

Pollen: Parsley can serve as a source of pollen for honey bees (see below under '**Additional information**').

Additional information: Parsley is protandrous[3] and according to McGregor[11], the stamens of a given flower ripen successively, and then after they have all ripened, they shed their pollen and wither, at which point the two styles begin to grow and the stigmas become receptive. This suggests that an individual flower, and perhaps even an individual umbel, is self-infertile, but might be cross-pollinated with pollen from another umbel of the same plant. Seed set that is benefitted from insect pollinators is one of the expected characteristics of a protandrous species. Burgett[4] found in a 1975 study that seed yield was 617 kg/ha (550 lbs/acre) in cages that excluded insects, 1278 kg/ha (1139 lbs/acre) in cages with honey bees and 1630 kg/ha (1452 lbs/acre) from the open field. In a 1976 study, the average percent seed set in cages that excluded insects was 22.0% and from the open field 64.8%. In the field, syrphid flies[4] were the numerically dominant parsley visitors early in the blooming period, but showed a large population decline prior to mid-bloom, whereas honey bee populations increased throughout the season. The returning daily percent parsley pollen increased steadily from 44% at the start of the parsley blooming period to 63% on day 21, which probably reflected a decrease in profitable foraging opportunities from outside the field, and might also have resulted in part from a decrease in competition from the syrphid flies.

Of the total blooming period of about 35 days, the increase in seed set primarily resulted from pollinator activity between day 7 and day 28, and there was no further increase from that point to day 35, despite the fact that pollinators were still in the field. Warakomska et al.[17] reported that parsley isolated from pollinators set 7-55% less seed one year and 21-38% less another year than did open-pollinated plants.

Recommendations for the number of honey bee colonies per acre seem quite scarce. Neither McGregor[11] nor Delaplane and Mayer[5] provide this information. While Burgett[4] made no attempt to quantify the relationship between pollinator density and seed set, he does indicate that under the conditions of the study (described above), 2 colonies per ha (4.9 per acre), supplemented by the non-apis[5] pollinators provided a commercial seed yield in excess of 1400 kg/ha (1247 lbs/acre) during both years of the study.

[3] **Protandrous: The anthers release their pollen before the stigma is receptive.**

[4] **Syrphid flies: A group of flies belonging to the family Syrphidae that are often found at flowers. They often 'masquerade' as bees and other flying hymenoptera.**

[5] **Apis: The genus to which honey bees belong**

[6] Oblanceolate**; lance head shaped with the broadest point beyond the midpoint with the long taper occurring at the attached end of the leaf. Ob- indicates the opposite of, which in this case is the opposite of lanceolate where the broadest point is before the midpoint and the elongated taper is at the unattached end of the leaf.**

[7] Ovate**:like a longitudinal section through an egg with the broadest portion near the point of attachment.** Orbicular**: approximately circular.**

[8] **Palmately parted: with deep cuts into the leaf leaving the leaf shape somewhat like a hand.**

Leavenworth's eryngo, purple thistle

Scientific name: *Eryngium leavenworthii*

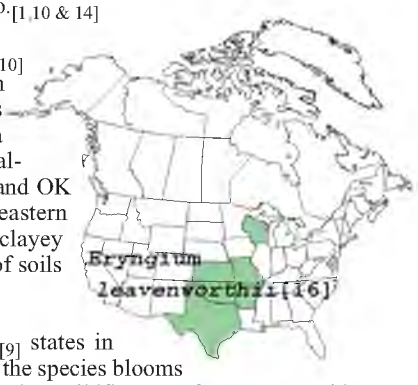
Origin: Leavenworth's eryngo is native to the United States[16]

Plant description: The species is an upright, relatively slender, prickly annual or winter annual 20-40 inches high that often branches broadly in its upper portion. The lower leaves have short stems and are broadly oblanceolate[6] to 6 cm (2.4 in) long and 2 cm (2.79in) wide. The stemless upper leaves are broadly ovate to orbicular[7], and deeply palmately parted[8] with the "fingers of the hand" having additional side divisions that end with sharp, stiff points. The leaf shown here is an upper leaf.

The individual minute flowers have five blue to purple petals and long slender protruding blue to purple stamens. The flowers are numerous and mixed in with small spiny bracts and are tightly packed in an elongated terminal head-like cluster that is about 0.78 inch in diameter and 1.4 inches long. Each end of the flower cluster displays several conspicuous spiny bracts 1.2 to 1.6 inches long. The 1 to 2 mm long fruit has nearly parallel sides and is not as wide as long and is covered with white scales.

Most of pictures of the species on the web as well as in two Texas wildflower books[1 & 14] suggest that the plant is generally some shade of purple. As a result, I began to wonder if the species I had grown was actually *Eryngium leavenworthii*. Some of the pictures on the web suggested that it does exhibit a fair amount of variation in the amount of purple it displays, and during a trip to the Michigan State University Herbarium I found a great deal of color variation in their collection, as well as one specimen that showed no indication of purple. In the remainder of the herbarium's additional 26 North American *Eryngium* species, I found nothing that resembled *Eryngium leavenworthii*. While the specimen pictured here may be a bit unusual, I am quite certain that it is Leavenworth's eryngo.[1,10 & 14]

Distribution: McGregor[10] states that the species is an inhabitant of rocky prairies and open woodlands with a decided preference for calcareous soils. In both KS and OK it is an inhabitant of the eastern sections. Ajilvsgi[1] adds clayey and sandy soils to the hst of soils in which she finds it.



Blooming period: Lovell[9] states in the Bay City Area of Texas the species blooms in July. Ajilvsgi[1] in her book, "Wildflowers of Texas", provides a blooming date range of July-October. McGregor[10] also provides a blooming date range of July to October.

Importance as a honey plant: Pellett[13] writes that the species is reported to furnish a good yield of honey. He also relates that Prof. S. W. Bilsing from the Texas College of Agriculture reports that the species is an important source of honey in the Bay City, TX area and furnishes a good yield during dry seasons in the mid-coast area of Texas. H. Lovell states that honey from the species is chiefly obtained from the coastal region of Texas. Interestingly Sanborn and Scholl[15], writing about Texas honey plants, don't mention the species. Neither does Oertel[12]. John Lovell[9] states that the species produces the most honey during extremely hot and dry weather.

Eryngium leavenworthii (Leavenworth's eryngo). The specimen that I raised for this sequence of articles appears not to be typical of the species. I have taken the liberty in the lower picture of reproducing one of the floral bracts in a color that would more nearly match more typical wild specimens. Plant raised partly in greenhouse and date and locality information are of no significance. Seeds from Native American Seed, Junction, Texas.

Honey: Pellett[13] reports that the honey is of very poor quality, but Prof. Bilsing apparently described the honey as dark in color with a not unpleasant taste. John Lovell[9] states "the honey is dark-colored with a poor flavor." Harvey Lovell[8] reports the honey is amber and of "rather poor quality". The Goltz edition[6] of this manual simply reiterates the earlier edition.

Additional information: The species is apparently good for making dried flower arrangements. Ajilvsgi[1] claims the plant will remain purple for several months in these arrangements, but as indicated above, all but one of the plants of this species in the Michigan State University Herbarium were also varying degrees of purple and many of them were many years old.

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THE BEEKEEPER'S NEW CLOTHES

by HOWARD SCOTT

Something has changed in the world of beekeeping.

Thirty years ago, when I told people I was a novice beekeeper, they would scrunch their shoulders and utter, "Yuck! Why in the world are you doing that? Working with disgusting crawling insects that sting. Are you a sadist or something?" My parents suggested that beekeeping was something only poor people did to supplement their diet.

These days, the response is quite different. "I keep bees," I might mumble in a soft voice. Eyebrows shoot up. Expressions come alive. "You're an apiarist," someone might offer. "Wowie. Cool. Tell me what's going on. I worry about the bees disappearing. Is it a symptom that our environment is falling apart?"

I straighten my glasses and adjust my face to appear authoritatively wise, and in modulated tones, suggest that this year is a great one for us hobbyists. "Our club is over 200 members strong, and we train 45 new beekeepers each year at our Bee School. Furthermore, we're all having bountiful harvests this season. So, no, I don't think our habitat is in trouble. Somehow, I feel we're doing enough right things to keep it working."

What gives? From eccentric to sage in 30 years? Today, we are environmental saviors on the cusp of a changing world. Why has there been such a primal shift in attitude towards apiarists? I am no more wise now than I was 30 years ago, and a bit thicker in the midriff and grayer on top to boost, so why the change? Why have we beekeepers become, if not celebrities, at least local heroes?

First, there is a heightened environmental awareness that wasn't present 30 years ago*. In the 80's, green referred to money. Organic referred to a chemistry course one must take to get into medical school. Global warming was a term no one knew. Today, the state of the environment is equivalent to the Cold War of the 50's. The Kyoto Protocol declared world commitment to fighting pollution. Senator Al Gore was awarded the Nobel Prize for explaining the seriousness of global warming. A politician's green position might make the difference between victory and defeat. Many perceive the planet on the threshold of extinction.

Yes, dire predictions have been around for awhile. In the 17th century the economist Thomas Malthus said that the world population faced extinction because the food supply was increasing at an arithmetic rate, and the population was increasing at a geometric rate. In the 1950's and 60s, Rachel Carson said that our land was slowly becoming poisoned because of the chemicals used on the soil. But the current predictions of environmental collapse are more scientifically based and clinically observed. Furthermore, a vast number of scientists from different areas of expertise see the same phenomena from different angles.

As man's attempt to harness nature for its own bounty, beekeeping is at the crossroads of this cliffhanger. Are we heading for enviro-Armageddon or can we retain our pastoral bounty? In a sense, beekeeping is the canary in the mine shaft. If the bees don't flourish, can Earth's demise be far behind?

Colony Collapse Disorder (CCD) is the most recent sign. Healthy hives one day and empty hives the next is something that never had happened up to now. Many practitioners argue, CCD threatens the very existence of domestic beekeeping. What is the truth? Is it gross exaggeration, the angry outburst of a few vocal beekeepers? Or is it an emerging syndrome, which, one day, might devastate every bee yard?

One reason beekeeping has new found respect is that we're a window into this dangerous brave new world. Indeed, it could be said that we're the hope of tomorrow.

Second, the organic movement has prodded many people to think about what they put in their mouths. Thirty years ago, people wanted tasty chow. Fast food was newly in vogue. Meat 'n potatoes were standard bill o'fare. Today, people want healthy sustenance. That means unhampered, unprocessed, without chemical additives, and local, if possible. A vast industry has grown up around healthy foods. Natural food retail shops have become the provider of choice for health-conscious consumers. Whole Foods has emerged as a vibrant and trendsetting national supermarket chain specializing in healthy choices. Area farmer's markets, as well as organic product co-ops, dot the consumer landscape, touting local produce. The Locavore movement—to eat primarily foodstuff grown within 100 miles—is gaining currency.

Honey is organic local food, par excellence. Honey bees collect nectar from local flora, and evaporate the liquid content to about 18% to make perfect pure, mostly organic honey. Because local beekeepers don't batch or blend (read: heat) their product, local honey, is envisioned as a much healthier product than the supermarket variety. Indeed, the difference between these two methods of honey preparation is emerging

*Editor's Note: For those of us who remember the 1960's and 70's, however, today's environmental concerns and increased interest in beekeeping mirror many aspects of the "Ecology" and "Back-to-the-Land" movements that were very popular then.

as the example to behold for discriminating organic consumers. Looks the same, tastes pretty similar, but one is healthy for you and the other is just intake.

Prices reflect this distinction. Supermarket honey in my area currently sells at $5 to $6 a pound. Local honey goes for $7 to $9 a pound. Twenty years ago, there was no price differential. Today's consumers actually pay a premium to eat local honey. This year, my club will sell its honey at the ten-day Marshfield Fair for $9 a one-pound jar and $16 a two-pound jar. It has gone up a dollar a year for the last four years, and the organization still sells out all its honey—about $7,000 worth—every season.

So many people value local honey that we beekeepers are now considered community resources.

Third, we beekeepers fit nicely into the anti-greed movement. Thirty years ago were the go-go 80s. Everybody was making money in the stock market (the Dow Jones Industrial Average tripled), buying McMansions, and churning through their toys like there was no tomorrow. For sure, that is still being done, but perhaps as a society, we are a little surfeited with 30 years of excess. Fat cats are no longer so pretty with their Hummers, expensive gadgets or closets full of shoes. There is the sense that those who live reasonably and within their means are princes of the earth.

Beekeepers fit perfectly into this zeitgeist. Although exceptions exist, we are not men and women of wealth and ostentation. We are folks of the earth, grounded by the flowers around us, uplifted by sights of local bounty, not artificial beauty. When people find out about our vocations/avocations, they ask us if we sell honey. Most of the time, they don't ask how much we charge. They look in our eyes and know they can trust us.

For all these reasons, unlike Rodney Dangerfield, beekeepers have found new respect.

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