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AMERICAN BEE JOURNAL

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April Cover Picture

Honey bee foraging on willow catkin (*Salix* spp.). Willows are one of the first major spring nectar and pollen sources over much of North America. Tibor I. Szabo (RR 1, Puslinch, Ontario, Canada N0B 2J0) took this excellent photo.

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Letters to the Editor

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!

WHAT ARE BEEKEEPERS LOOKING FOR IN A QUEEN?

For the last three years, we have been producing queens and we have been overwhelmed with orders. We, like all queen producers, work hard to provide a queen that beekeepers rave over. We have found that talking to beekeepers and listening to their positive or negative feedback helps us in providing the type of queen they want.

As beekeepers, we have high expectations for our queens. Even when we have neglected or mismanaged our hives, we blame the problem on the queen. If the hive fails to make a large honey crop, we blame it on a poor queen, even though the weather was the worst in 30 years. If the bees die in the winter, we blame the queen and the queen producer who sold us the queen. We are hoping for a new breed of queens to save the day, but is this false hope?

In my home state of Illinois, we have started the Illinois Queen Initiative with a goal of producing local Midwest queens that are more accustomed to our climate, possess hygienic behavior, are winter hardy and are good honey producers. More and more states have such programs, turning to the queen to conquer all pests and diseases in the hive. This is placing a huge demand on breeders to present a queen that will bring a new sense of hope to beekeeping. But just what are beekeepers looking for in a queen?

I recently placed a survey on our website to find out what beekeepers want in a queen. I was very surprised at the results of this simple survey. Again, this is a simple survey I placed on my blog, but 673 people responded to the question: "When buying a queen, what is the most important queen characteristic you want to see?" Each participant had to pick one of the following six characteristics:

Honey Production
Gentleness
Winter Hardiness
Disease Resistant
Swarm Reduction
Mite Resistant

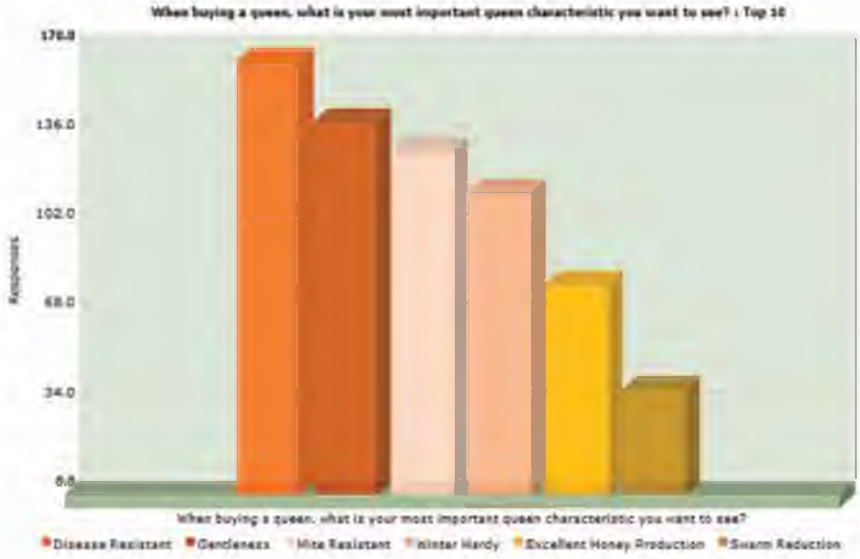
I was certain that the beekeeper's number one characteristic would be gentleness. After all, this seems to be the first trait beekeepers talk about when referring to their hives. And who doesn't talk about how much honey their hive produced? But much to my surprise, the number one characteristic that beekeepers want to see in their queens in disease resistance; 165 beekeepers chose disease resistance to be most important.

The second most important characteristic is gentleness, with 142 beekeepers weighing in. The third most important characteristic, with 131 beekeepers voting, is mite-resistant queens. Coming in fourth was winter-hardy queens, winning the hearts of 115 beekeepers. Fifth place was honey production with 80 votes. Last place was swarm reduction at 40 votes.

In summary, this survey tells us that beekeepers are willing to forgo honey production and gentleness if it means raising queens that can fight off diseases. As much damage that mites have done, the survey shows that beekeepers must be coping with mites to a manageable degree because they would rather have gentle bees than mite resistant bees.

Maybe our expectations for our queens are too high, or are they? As we continue to look for that silver bullet to solve all our beekeeping woes, just maybe the solution to our problem is that single bee in the hive with that little dot on her back. If so, those of us raising and selling queens need to listen to what the beekeepers are saying and continue to work toward queens which are resistant toward diseases, gentle, mite resistant, winter-hardy, produce good honey and do not swarm, in that order.

David Burns
Long Lane Honey Bee Farms
Fairmount, IL



FIRST EARLY SEASON FLIGHT

First spring flight (Fred Sloop photo)

After many weeks of very cold weather, punctuated by several snowy periods, a short stretch of warm weather is coaxing our bees out of their winter clusters to cleanse their constitutions and collect early season pollen from witch hazel, crocus and dandelions. One of our Cordovan Italian honey bees decided to briefly warm herself on this beekeeper's finger. I've attached a photograph of the brief encounter for the enjoyment of all.

Fred Sloop
Buzzy Bee Apiary
Oak Ridge, TN

BEEYARD SIGN

W.I. Yerby's beeyard sign

Enclosed is a photo of the posted sign I designed for my beeyard utilizing the Navy Seabee emblem. It gets alot of attention, even from law enforcement. So far, I haven't had any problem with theft or trespassing. I keep my hives on a cattle trailer enclosed with re-bar to keep the bears at bay. The trailer is moved as needed to wherever the nectar and pollen source and brought back to the bee yard in the winter.

W I. Yerby
Brodnax, VA

DONATIONS REQUESTED FOR PROPOSED NEW MINNESOTA BEE LAB

I want to address you and call you what you are: A "Keeper of Bees" not a "beekeeper". The difference is your willingness to go far beyond what is expected. I am asking that of you today. We need to support the new Bee Research Center at the University of Minnesota. I am not a professional fundraiser, so I don't have a slick presentation for you. I can only tell you from my heart that I passionately believe in this project.

You are a part of a very special group of people. You know as well as I do that those who are most successful with bees are innovative, hard working, creative, and able to visualize results. You like the outdoors, nature, traveling and sunshine during pollination. You can handle the setbacks and put-downs. Most importantly, you are willing to help each other out—even loan equipment or help others to rebuild when disaster strikes.

Once again, it's time to step forward beyond what is expected. We NEED this lab. And, the University of Minnesota NEEDS our help.

I am talking about the Center for Bee Research and Discovery at the University of Minnesota. I've been involved with this project for some time. I believe so passionately in this that I decided to include it in my will. My gift will be in honor of the Keepers of Bees who inspired others—People like my John, Homer Park and Cliff Thomas.

The work being done by the talented scientists at the "U" of "M" has far surpassed the present facilities. It's time to upgrade, rebuild and enlarge. The days of keeping bees in hollow logs has gone. Research has pulled us out of the past and is helping with the current day's problems and I pray for more solutions in the future.

I ask you to consider giving and maybe even more than a one-shot gift. Whether or not you choose to be a part of this, please share this information with others who have the means and heart to support this goal.

Thanks so much. I have always supported Keepers and will continue as long as I am able. This is not lip service on my part, but an appeal from my heart for your help and my continued loyalty to you the Keepers and the Bee Industry.

For questions about donating money for the proposed new Minnesota Bee Laboratory contact the CFANS Development Office at (612) 624-4285 or by email at **cfansdev@umn.edu** With your help, we can take our solution driven science to the next level.

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ROYAL HAWAIIAN HONEY WEBSITE

As an *American Bee Journal* subscriber, I am excited to introduce you to our freshly redesigned Website: **www.royalhawaiianhoney.com**. The Royal Hawaiian Honey brand is harvested by my family's apiary on Hawaii's Big Island. It is comprised of Organic Christmas Berry Honey, Organic Lehua Honey and Macadamia Nut Blossom Honey.

The new site includes links to our "Values", "High Vision", and "Principles". In addition to being one of only a handful of certified organic apiaries in the entire U.S., we are also the first food manufacturer in the U.S. to obtain a carbon neutral designation for our products. Though we are a small business, we think big.

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MILD NORTHWEST WINTER

Honey bees work early spring flowers in Washington State. (Franclyn Heinecke photo)

While most of the U.S. shivers and shovels out snow, we in the Pacific Northwest are experiencing our mildest winter on record. Temperatures have been ranging from 45 - 55 for several days and it is expected to continue for the next few days. Those temperatures are causing problems on the Olympic ski slopes in Vancouver, B.C., but it sure is pleasant for our bees. Bees have been gathering pollen for a few weeks now. Here are some photos of the activity this morning.

Franclyn Heinecke
Puyallup, WA

THE GROWING BUZZ IN UGANDA

I am writing to inform your readers of a need to locate a beekeeping expert who may be willing to take on a new challenge in the Rwenzori Mountains of Uganda. Beekeeping is an exciting and challenging profession, which provides the only source of income for many communities and enables them to take advantage of the rich natural

Beekeeping in Uganda

resources within the Kasese District. The Liberty Development Foundation (LIDEFO) is a locally run Community Based Organization that views beekeeping as a sustainable and effective means of enabling villagers to produce a small income for their families. As a result, LIDEFO currently has over 60 active members and over 400 beehives ranging from local hives, Johnson hives and modern Langstroth hives. Most of these hives are made locally in Kilembe village and a Johnson hive for example costs US$10 to construct. LIDEFO provides basic training to the carpenters on hive production and then sells the hives on to community groups at an affordable price.

As a committed development worker for LIDEFO, I have been privileged to attend numerous village meetings with the community elders and members of the LIDEFO beekeeping groups and have been overwhelmed by their enthusiasm. Although beekeeping is their livelihood, many involved started out collecting honey from under fallen trees and trading it in kind, so beekeeping as an enterprise is new to them. Many of the villagers within this group do not have the correct equipment or protective gear; nevertheless they have their hearts set on learning everything they can about beekeeping so as to improve their livelihoods.

In all the meetings I have attended, underlying problems emerge such as the lack of education and training, correct beekeeping methods and honey processing techniques. These villagers crave the basic beekeeping skills needed so that they may call themselves beekeeping farmers. Within my role as the local Business Advisor the beekeepers have not once asked me for money – but have made one simple request. The greatest need the community has is for someone, anyone, who is willing to come and educate and train them in the fascinating world of bees.

We are therefore desperately seeking our knight in shining armor, an apiary specialist who is willing and able to visit the Kasese district in Uganda for 2 weeks or preferably more to address the many issues highlighted above. LIDEFO will happily provide accommodation and local costs such as food and in return we can guarantee a hugely rewarding experience. All we ask is that the specialist has a good understanding of the beekeeping process; no specific qualifications are needed. The Rwenzori Mountains are spectacular and richly green, covered by coffee and banana plantations. Uganda has one of the highest concentrations of primates in the world and arguably the world's best bird watching. We are also only 30 minutes from the equator and the Queen Elizabeth National Park, with many exciting places to visit in the vicinity. Please contact Edwin Harrison, Business Advisor for LIDEFO (www.lifefo.org) on **edwin_harrison@hotmail.co.uk** if you are interested in this opportunity of a lifetime.

Edwin Harrison

FIRST YEAR OF BACKYARD BEEKEEPING IN FLORIDA

Feral colony of European honey bees 12 feet high in an oak tree in St. Cloud, FL. ***(Photo by Christopher J. Stadler)***

On Feb. 27, 2009 1 had a nice visit with Jerry Crews, a Florida Apiary Inspector, who came in the morning and gave me loads of great advice on making a split & took a sample of 50 of my workers to check for Africanized genetics. He questioned me on how many hives I intended to keep in our backyard and I explained "just two" as he could sense that I had caught beekeeping fever. We sat at the kitchen table and had a nice chat and he welcomed all my eager questions and took his time to give me great advice from his wealth of experience from his last 35 years in the apiary business.

Later that afternoon I split my hive as I received an Italian "Big Island Queen" with her attendants in a queen cage shipped from Olivarez Honey Bees, Inc. in Hawaii. I put several frames with bees & brood, including some stored pollen & honey, in the new deep hive body and set the queen cage between a couple of those frames and secured it near the top by putting some twist ties around the queen cage and laying the ends over the top bars.

I started harvesting honey in early May and estimate that both hives produced well over 100 pounds of honey, each. I gave honey to lots of friends and family members, acquaintances at work, and neighbors. And enjoyed using it at home and started baking with it and developing my own recipes. I had enjoyed photographing the butterflies brought to our yard through selectively planting host plants for larvae and nectar plants for the adults, and my interest in photographing insects developed more with my new hobby with beekeeping. I even entered several photographs of pollinators in the Florida Museum of Natural History's "Butterfly Fest" which took place in October ... including the one of a Honey Bee on a Coral Vine flower in our yard. The honey bees are especially fond of the Coral Vine and can be seen working the flowers most every day, when the sun is out.

My spring & summer wildflower honeys were a rich red-amber and the fall honey was a much lighter grade of amber. I assembled wax comb in frames & installed them in a shallow 4 3/4 inch super for cut comb honey and had 2 harvests from my new split ... on top of shallow super which I was harvesting from regularly. We invited friends & neighbors over for Honey Extraction Parties. I gave my honey with cut comb in pint size mason jars to friends & family as home made holiday gifts, along with some Calamondin Marmalade that came from the tree in our yard (Calamondins are a very tart citrus tree fruit that make a delicious marmalade.) And I even made beeswax candles to offer special friends.

In August I received a call from Rosa & George Van Horn at the Reptile World Serpentarium in St. Cloud, FL. They are family friends & I have volunteered with their Serpentarium over the years & obtained my Venomous Reptile License during my service. They found a feral colony of honey bees in a pegboard box used for venomous snakes that was next to their Serpentaium. I rescued the colony ... it was too easy ... by just lifting the latch & using my hive tool to remove the layers of comb & attach them to frames with rubber bands, then installing the frames into the Nucleus Hive. As the Van Horns already have hundreds of snakes, turtles, many lizards, frogs, and even some crocodiles & alligators to care for along with their family, they did not want to start beekeeping. So, I offered to get a mutual friend of ours started in beekeeping. She lives several miles North of the serpentarium on 10 acres in Narcoossee & she was interested. The relocation went well. Like myself, she is a graduate from the University of Florida College of Agriculture (now known as "CALS"...College of Agriculture & Life Sciences) and is enjoying this new pursuit in beekeeping. She even intends to use her farm raised goats' milk to make a soap with her honey.

Hopefully this new beekeeper will have such good fortune with her honey bees as I have experienced with the feral colony that moved into our yard. It is a great experience to care for such industrious animals that produce such great products from the hive.

It has been especially nice to receive encouragement from beekeepers. My involvement with the Orange Blossom Beekeepers Association, the Florida State Beekeepers Association, and the Apiary professionals from the State & the University of Florida have really enriched my experience.

Christopher John Stalder
Environmental Scientist, Agronomist,
Beekeeper & Herpetoculturalist
Belle Isle, Florida

FLORIDA'S FOOD SAFETY REGULATIONS RELATING TO BOTTLING

The header for Ms. Nancy Gentry's letter in the February 2010 issue of *American Bee Journal* is glaringly incorrect. The resolution presented by the Apalachee Beekeepers Association (ABA) seeks relief from Florida's food safety regulations relating to bottling (Chapter 5K-4.004, Florida Administrative Code) for certain beekeepers, NOT from the Florida Honey Standard (Chapter 5K-4.027, 5K-4.028 Florida Administrative Code). The Florida Honey Standard addresses what goes in the bottle, not how it gets put in there.

A thorough understanding of this letter requires an historical perspective. Our resolution, which may be viewed at the ABA website (http://sites.google.com/site/apalacheebee/), was presented to the Florida State Beekeeping Association (FSBA), and a committee was formed to further research the issue and report back to the FSBA Board of Managers (BOM). The committee report (also available on our website) was submitted to FSBA for consideration at the 2008 Annual meeting. The committee report recommended two possible statutory changes and a Best Management Practice for small honey producers. One statutory change would add a specific exemption from the food permit requirements for "Registered Florida beekeepers that produce, bottle and sell their own honey." This approximates the exemption granted to sellers of peanuts in the shell, parched, roasted or boiled and persons selling sugar cane or sorghum syrup. The other proposed statutory change would define honey as a raw agricultural commodity. Establishments that pack raw agricultural commodities are not included in the definition of a "food establishment" (Section 500.12(1)(a), Florida Statutes). Lastly, the committee report recommended adoption of Best Management Practices which would allow small beekeepers/honey producers to bottle or package honey in a home kitchen with common-sense restrictions or in a detachd honey house. If the honey house does not have a toilet room provided, then a restroom, in a nearby home, farmstead or business can be utilized. Also, since minimal water is used for hot water washing or equipment and for warming the honey prior to packaging, this water would not fall under the classification of "wastewater," but should be disposed of in a manner that does not create an unsafe or unsanitary condition for the food establishment. Also, a portable container of potable water, such as a water cooler, could be used as the soure of running water etc. Delivery of the committee report was declined by the FSBA BOM because of the pending honey standard. There is no mention anywhere in either document of an exemption from the honey standard.

One of several constitutional purposes of the ABA is to: "Promote non-Africanized honeybees and beekeeping generally and to broaden the knowledge of beekeeping and improve the beekeeping skill among its members." Recent nationwide interest in small-scale farming in general and the surging interest in hobby-scale beekeeping can be viewed only as a positive trend. The ABA's interest in relief from onerous, excessive and unnecessary bottling regulations was to allow those beekeepers with only a few hives to be able to recoup a portion of their expenses through sales of honey without having to spend $20,000 to $30,000 to build a bottling facility meeting regulatory standards.

There are enough obstacles to keeping bees without beekeepers fighting among themselves and one group spreading misinformation about what another group is trying to accomplish. All we are asking is that the same support be given to the small beekeepers seeking relief from the bottling laws that was given by the small beekeeprs to passage of the Honey Standard. It is indeed sad that the State of Florida was the first to pass a Honey Standard and at the same time lags behind other states like Mississippi and Illinois who are offering regulatory relief in support of their small beekeepers. Both ABA and other small beekeepers recognize that all beekeepers benefit when the consuming public can be assured that their honey is a safe and wholesome product.

This discussion should be put to rest any further narrative or assertion that the ABA seeks exemption form the Florida Honey Standard.

Charles Robert Futch, President
Apalachee Beekeepers Association

ALMOND POLLINATION

Beekeepers Going to California Almonds Next Year 2011. Make arrangements now with almond growers for next year 2011. Use a signed contract and set a price. This year's range of prices for eight-frame colonies seems to be $130 to $160. Next year's price range might be similar, but is negotiable. If you need more growers, you can take several steps now. Advertise on Craig's List. Advertise in Classifed Ads in *Almond Facts*, P.O. Box 1768, Sacramento, CA 95812, tel 916-442-0771. Advertise in *AgAlert* Classifieds, 2300 River Plaza Dr., Sacramento, CA 95833-3293, tel 916-561-5572, It's never too early to prepare for next year. The growers will thank you.

Alan Buckley
Portola, CA

VIRGINIA ASSOCIATION WINS BOOTH AWARD

The Tidewater Beekeepers Association (TBA), Virginia's largest beekeeping organization, won 2nd place for the "Best Educational Booth" at the Mid-Atlantic Home & Flower Show held in Virginia Beach, VA. The event took place Feb. 5-7 and hosted more than 500 exhibits and displays of home and gardening products and services.

With an attendance of more than 25,000 people, the TBA had a wonderful venue for getting the message out on the importance of honey bees to our local environment. Local honey and hive products were sold, but our primary goal was getting the message out to the attendees about the importance of honey bees, introducing the basics of beekeeping, and demonstrating many of the wonderful aspects of beekeeping.

Carol Watkins
Virginia

BIOLOGIST DISCOVERS 'STOP' SIGNAL IN HONEY BEE COMMUNICATION

A biologist at UC San Diego has discovered that honey bees warn their nest mates about dangers they encounter while feeding with a special signal that's akin to a "stop" sign for bees.

The discovery, detailed in a paper in the February 23 issue of the journal *Current Biology*, which appears online today, resulted from a series of experiments on honey bees foraging for food that were attacked by competitors from nearby colonies fighting for food at an experimental feeder. The bees that were attacked then produced a specific signal to stop nest mates who were recruiting others for this dangerous location. Honey bees use a waggle dance to communicate the location of food and other resources. Attacked bees directed "stop" signals at nest mates waggle dancing for the dangerous location.

James Nieh, an associate professor of biology at UCSD who conducted the experiments, said this peculiar signal in bee communication was known previously by scientists to reduce waggle dancing and recruitment to food, but until now no one had firmly established a "clear natural trigger" for that behavior.

The stop sign is a brief vibrating signal made by the bee that lasts for about a tenth of a second with the bee vibrating at about 380 times a second. "It is frequently delivered by a sender butting her head into a recipient, although the sender may also climb on top of the receiver," Nieh said.

Bee researchers originally called it a "begging call," because they believed the signaling bee made it to obtain a food sample from the receiver.

But Nieh discovered in his experiments that one trigger for this signal-which caused the waggle dancers to stop and leave the nest-was attacks from bee competitors and simulated predators. The more dangerous the predator or competitor, he found, the more the stop signals bees produced to stop other bees from recruiting to that location.

"This signal is directed at bees who are recruiting for the dangerous food location and decreases their recruitment," explained Nieh. "Thus, fewer nest mates go to the dangerous food site. This is important because an individual experiences danger and stops recruiting, but the stop signal enables her to 'warn' nest mates who have not yet experienced danger and are still recruiting. The end result is that the colony will reduce or cease recruitment to the dangerous food patch in proportion to the danger experienced."

Nieh found in his experiments that during aggressive food competition, attack victims significantly increased their production of stop signals to nest mates, some by more than 40 times. Bees foraging for food that attacked other bees or experienced no aggression did not produce stop signals. But bees exposed to a "bee alarm pheromone" increased their stop signaling by an average of 14 times. Those whose legs were mechanically pinched in a simulated bite increased their stop signals by an average of 88 times.

Nieh said that cooperation within and between cells in an organism relies upon positive and negative feedback. "Superorganisms," such as honey bees, are like a multi-cellular organism because each individual bee, just like a body cell, acts for the good of the whole, the colony. Superorganisms use many types of positive feedback signals, but there are few known examples of negative feedback signals.

What's interesting to biologists about the discovery of the stop sign, Nieh said, is that it's an example of a negative feedback, in which the colony's actions are stopped for the good of the colony.

"This is only the second example of a negative feedback signal ever found in a superorganism and is perhaps the most sophisticated example known to date," he said. (Kim McDonald, scinews@ucsd.edu)

ENTOMOLOGIST MAY R. BERENBAUM WINS PUBLIC UNDERSTANDING OF SCIENCE AWARD

The American Association for the Advancement of Science (AAAS) has named May R. Berenbaum, professor and head of the Department of Entomology at the University of Illinois at Urbana-Champaign as winner of the 2009 AAAS Public Understanding of Science and Technology Award.

Berenbaum was honored for "her extraordinary ability to integrate her original research on the world of insects with her inspirational efforts to communicate the wonders and complexity of nature." She will receive the award during a 20 February ceremony at the 2010 AAAS Annual Meeting in San Diego.

Specifically, the AAAS award committee said: "One of the most respected entomologists in the world, Dr. Berenbaum is distinguished by a career that uniquely combines high-impact scientific discovery and effective public engagement. She transformed chemical ecology, a field that seeks to understand nature in chemical terms, by pioneering its integration with genetics."

In addition to research that has transformed the field of chemical ecology and has had a major impact on agriculture and the environment, Berenbaum was described in a 1997 *New York Times* article as "the most relentless creative insect advocate in the world." She is the legendary creator of the "Insect Fear Film Festival," which melds entomology and film into a new, successful form of public engagement with science. Now more than 25 years old, the annual event draws thousands of viewers and international media coverage.

Throughout her career, Berenbaum has emerged as an authoritative public source of information on insect problems. The prize selection committee commended her extensive service to the National Research Council (NRC), where she is a National Associate, an honor reserved for National Academy of Sciences members who make extraordinary contributions to the NRC. Her work as a National Associate has included chairing the committee on Colony Collapse Disorder (CCD), which issued its report on the status of pollinators in October 2006 - months before the massive disappearances of honey bees across the country. She emerged as the CCD spokesperson for the scientific community, and she has written op-ed articles and testified before Congress on the issue.

AAAS Chief Executive Officer Alan I. Leshner, executive publisher of the journal Science said: "In recognition of her paradigm-changing scientific discoveries as well as her passionate dedication to public understanding of science, Dr. Berenbaum is highly deserving of the 2009 AAAS Public Understanding of Science and Technology Award."

A prominent entomologist interested in the chemical interactions between herbivorous insects and their host-plants, Berenbaum has studied the implications of these interactions on the organization of natural communities and the evolution of species.

She graduated summa cum laude with a B.S. degree and honors in biology from Yale University in 1975. She attended graduate school at Cornell University and received a Ph.D. degree in ecology and evolutionary biology in 1980.

Since that time, she has been a member of the faculty of the Department of Entomology at the University of Illinois at Urbana-Champaign and has served as head of the department since 1992. In addition to her research, she is devoted to teaching and to fostering scientific literacy. She is the recipient of the 1996 Entomological Society of America North Central Branch Distinguished Teaching Award. She has authored numerous magazine articles, as well as three books about insects for the general public.

Established in 1987, the AAAS Award for Public Understanding of Science & Technology recognizes scientists or engineers who, while working in their fields, have also contributed substantially to public under-

standing of science and technology. Contributions include books, articles in magazines and newspaper, broadcasting, lecturing, museum presentation and exhibit design. (American Association for the Advancement of Science)

HIGH AWARD FOR HONEY BEE EXPERT ERIC MUSSEN OF UC DAVIS

Honey bee guru Eric Mussen, an Extension apiculturist and member of the UC Davis Department of Entomology, is the winner of the statewide 2010 Pedro Ilic Outstanding Agricultural Educator Award for his work in educating the agricultural community, the beekeeping industry and the general public about honey bees. (Photo by Kathy Keatley Garvey)

DAVIS--Honey bee guru Eric Mussen, an Extension apiculturist and member of the UC Davis Department of Entomology faculty since 1976, is the winner of the statewide 2010 Pedro Ilic Outstanding Agricultural Educator Award for his work in educating the agricultural community, the beekeeping industry and the general public about honey bees.

Mussen, considered by his peers as one of the most respected and influential professional apiculturists in the nation, will receive the award March 1 at the California Small Farm Conference in San Diego. It is one of two annual awards memorializing Ilic, a Fresno County small-scale farm advisor who died in 1994. The other award, for outstanding grower, goes to Jay Ruskey of Calimoya Exotic Fruits of Goleta, Santa Barbara County. The company, which Ruskey founded in 1991, grows and markets California cherimoyas and other exotic fruits.

Mussen and Ilic worked together as members of the Small Farm Work Group in serving the statewide, broad-based agricultural community, said nominators Larry Godfrey, Extension specialist with the UC Davis Department of Entomology, and Michael Parrella, professor and chair of the department.

"They were alike in many ways: their dedication, enthusiasm, high energy, friendliness, their commitment to small-scale and family farming, and the easy-going way they imparted information on a diversity of projects, solving a multitude of problems—and sometimes at a moment's notice," Godfrey said.

Mussen educates the beekeeping industry and general public with his bimonthly newsletter, "from the UC Apiaries," which he launched in 1976. Since 1976, he has also written "Bee Briefs," addressing such issues as diseases, pesticides and swarms. Both publications are on the UC Davis Department of Entomology Web site.

"Eric is a worldwide authority on honey bees, but no problem is too small and no question too involved for him to answer," Godfrey said. "He devotes his research and extension activities to the improvement of honey bee health and honey bee colony management practices. Eric helps growers, consumers, UC Farm Advisors, agricultural commissioners, scientists, beekeepers, researchers, pesticide regulators, 4-H'ers, and state and national agricultural and apicultural organizations. He ignites their interest in maintaining the health of bees, cultivates their friendship, and generously gives of his time and intellect."

"With the decline of the honey bee population and the increase of the mysterious colony collapse disorder, his expertise is now more highly sought than ever," Godfrey pointed out. "Any threat to honey bees is a threat to agriculture and a cause for his concern and a desire to assist. He is the only Extension Apiculturist in the UC system and in many regards, functions as the Extension entomologist for apiculture in the western U.S. and indeed, much of the country."

Last year Mussen served as president of the Western Apicultural Society, an organization he helped found in 1977. He delivered the keynote addresses at the 2009 California State Beekeepers' Association (CSBA) and the 2009 American Honey Producers' Association conventions. In addition, he provides leadership roles in the CSBA, the California Bee Breeders' Association, California Farm Bureau Federation, American Honey Producers' Association, National Honey Board, American Beekeeping Federation, American Association of Professional Apiculturists, and the Northern California Entomology Society, among others.

ARE BEES ALSO ADDICTED TO CAFFEINE AND NICOTINE?

A study carried out at the University of Haifa has found that bees prefer nectar with a small concentration of caffeine and nicotine over nectar that does not comprise these substances at all. "This could be an evolutionary trait intended to make the bee addicted," the researchers say.

Bees prefer nectar with small amounts of nicotine and caffeine over nectar that does not comprise these substances at all, a study from the University of Haifa reveals. "This could be an evolutionary development intended, as in humans, to make the bee addicted," states Prof. Ido Izhaki, one of the researchers who conducted the study.

Flower nectar is primarily comprised of sugars, which provide energy for the potential pollinators. But the floral nectar of some plant species also includes small quantities of substances known to be toxic, such as caffeine and nicotine. The present study, carried out by researchers at the Department of Environmental and Evolutionary Biology and the Department of Science Education at the University of Haifa-Oranim, headed by Prof. Ido Izhaki along with Prof. Gidi Ne'eman, Prof. Moshe Inbar and Dr. Natarajan Singaravelan, examined whether these substances are intended to "entice" the bees or whether they are byproducts that are not necessarily linked to any such objective.

Nicotine is found naturally in floral nectar at a concentration of up to 2.5 milligrams per liter, primarily in various types of tobacco tree (*Nicotiana glauca*). Caffeine is found at concentration levels of 11-17.5 milligrams per liter, mostly in citrus flowers. In the nectar of grapefruit flowers, however, caffeine is present in much higher concentrations, reaching 94.2 milligrams per liter. In order to examine whether bees prefer the nectar containing caffeine and nicotine, the researchers offered artificial nectar that comprised various natural sugar levels and various levels of caffeine and nicotine, alongside "clean" nectar that comprised sugar alone. The caffeine and nicotine concentrations ranged from the natural levels in floral nectar up to much higher concentrations than found in nature.

The results showed that bees clearly prefer nectar containing nicotine and caffeine over the "clean" nectar. The preferred nicotine concentration was 1 milligram per liter, similar to that found in nature. Given a choice of higher levels of nicotine versus "clean" nectar, the bees preferred the latter.

According to the researchers, it is difficult to determine for sure whether the addictive substances in the nectar became present in an evolutionary process in order to make pollination more efficient. It can be assumed, however, based on the results of the study, that the plants that survived natural selection are those that developed "correct" levels of these addictive substances, enabling them to attract and not repel bees, thereby giving them a significant advantage over other plants. The researchers emphasized that this study has proved a preference, not addiction, and they are currently examining whether the bees do indeed become addicted to nicotine and caffeine. (Amir Gilat, Ph.D.,Communication and Media Relations, University of Haifa

EXPLORING THE INTIMATE WORLD OF BEES

NEW BOOK IN THE GROWING RUTGERS ANIMAL Q&A SERIES SHEDS LIGHT ON THESE EXCEPTIONAL CREATURES

Twenty-five thousand species of bees certainly create a loud buzz. yet silence

descended a few years ago when domesticated bee populations plummeted. Bees, in particular honey bees, are critical links in the vibrant chain that brings fruits, vegetables, and nuts to market and dinner tables across the country. Farmers and scientists on the agricultural frontlines quickly realized the impact of this loss, but many others did not see this devastation. WHY DO BEES BUZZ?: Fascinating Answers to Questions about Bees (Paper $21.95, March 2010, 978-0-8135-4721-3) reports on the mysterious "colony collapse disorder" that has affected honey bee populations, as well as other captivating topics, such as their complex, highly social lives, and how other species of bees are unique and different from honey bees.

Organized in chapters that cover everything from these provacative pollinators' basic biology to the aggressive nature of killer bees, this insightful question and answer guide provides compelling facts. With clarity and depth, bee biologist Elizabeth Capaldi Evans and co-author Carol A. Butler examine the lives of honey bees, as well as other species such as orchard bees, bumblebees, and stingless bees. Accessible to readers on every level, and including the latest research and theory for the more sophisticated reader, the authors reveal more than one hundred critical answers to questions about the lives of bees.

Concepts about speciation, evolutionary adaptation and pollination, as well as historical details about topics such as Mayan beekeeping and the appearance of bees in rock art, are arranged in easy-to-follow sidebars that highlight the text. Color and black and white photographs and drawings enhance the beauty and usefulness of Why Do Bees Buzz?

Rutgers University Press, 100 Joyce Kilmer Avenue, Piscataway, NJ 08854-8099, T: 732-445-7762 ext. 626, F: 732-445-7039, **http://rutgerspress.rutgers.edu**

FEDERAL GRANT HELPS MADISON COUNTY BEEKEEPER MAKE SURE BEES ARE HEALTHY

An Eaton, NY beekeeper is hoping to use a nearly $60,000 federal grant to improve conditions for the honey bee-production industry in the Northeast. Mike Johnston, who operates several bee yards in Madison County, has landed a federal specialty crop grant. It will allow him to study how to avoid losing bees to cold temperatures, and how to create hives that are more resistant to diseases and parasites plaguing the state's bee population.

Producers in New York state lose about one-quarter of their 28,000 nonmigratory hives each year to winter weather, Johnston said. Breeding more bees in the Northeast could mitigate the winter losses, which are partially attributed to stock purchased from the South, California or Hawaii that aren't adapted to cold climates.

Breeding more bees in the state would save $3 million in restocking costs over the next 10 years, an economic benefit that would be felt by local beekeepers and breeders. Johnston has put a lot of time and effort into his beekeeping enterprise.

He started his operation more than three decades ago with seven hives. Today, **Johnston's Honeybee Farm** has more than 200 hives, scattered across eight bee yards in Madison County that produced more than 6,000 pounds of honey last year.

Johnston, who works full time for Madison County's Soil and Water Conservation District, is in the process of turning his 2.3-acre parcel of land on Route 26 into an agritourism destination. For now, he sells his honey in glass and plastic bear-shaped jars at a roadside stand. But he's working on a full-scale store, with an observation area where visitors will be able to watch workers remove the combs from the hives and extract and bottle the honey.

Johnston said he hopes the study will result in the production of bees that are mite-resistant, but also mild-mannered, winter-hardy and good producers.

The U.S. Department of Agriculture awarded nearly $1 million to farmers to encourage the long-term viability of a variety of specialty crops grown in New York state. Specialty crops generate $1.34 billion annually in New York and make up one-third of the state's total agricultural receipts, according to state Agriculture Commissioner Patrick Hooker.

Courtesy of Alaina Potrikus, *The Post-Standard*.

Michael Johnston uses an electric hot knife to cut off wax capping from a frame of honey Monday at Johnston's Honeybee Farm, in Eaton, Madison County. Johnston has received a $57,025 federal grant that will help him to study ways to make honey bees more resistant to disease and cold weather.

THE SECRET LIFE OF BEES: RESEARCHER EXPLORES HONEY BEES' "WAGGLE DANCING" AND OTHER MYSTERIOUS BEHAVIORS

Newswise — How does a honey bee find its way in the world? How does it tell the other bees where it found the best food? Heather Mattila, assistant professor of biological sciences at Wellesley College, studies honey bee hives to find out how colonies work together to find food. It turns out a special dance they perform offers up clues to the process.

"So often, when you have animals going out and getting food in the environment, unless you can radio track them, you don't really know where they've gone," Mattila said. "But bees come back and do a 'waggle dance' that lets you know exactly where they've been. You could put a point in a map about where they've gone based on the information that's in the dance."

Mattila's research, recently featured in *Discover* magazine, has gained importance in the agricultural arena as honey bee populations have declined dramatically — and mysteriously — in recent years. According to the U.S. Department of Agriculture, 36 percent of colonies were lost in 2007-2008 alone.

From mangoes to mustard and almonds to apples, bees pollinate more than 400 crops that would be poor producers without their services — making their decline a major concern for the health of the world's food supply. By the latest estimates, bees in the United States add $15 billion in additional value to food supplies, contributing to about a third of our diet.

Mattila's research has found that when queen honey bees mate with many different male bees, creating a genetically diverse colony, honey bees are better able to resist diseases. They will also forage more and communicate more about the food that they've found. "Honey bees have a really sophisticated recruitment process for waggle-dancing and we know that it works a lot better when you have a lot of genetic diversity within the colony," she said. "The bees themselves, the individual foragers, are more likely to dance, they dance longer, more bees watch their dances, and more

bees leave the hive after they watch their dances."

Sought out by beekeepers across the nation, Mattila tells them how to keep colonies healthy and maximize the genetic diversity of hives. On the Wellesley College campus, Mattila has established 40 full-size hives, which in summer house up to 50,000 bees each. By April, Wellesley will have completed the building of a new research space that will contain nine more observation hives of about 2,000 bees each, including video equipment for each hive.

This spring Mattila will teach the course "Animal Behavior," with Assistant Professor of Biology David Ellerby, for the first time, exploring how animal behaviors have evolved to meet the challenges of reproduction and survival — touching on topics including parental care, communication, conflict and aggression. Students will take part in labs including one on treating the notoriously aggressive Betta fish with Prozac to see how the chemical alters their behavior. They will also spend several weeks observing honeybee hives.

Wellesley senior Morgan Carr-Markell, of Shorewood, Wis., said she has always considered social insects fascinating. She became involved with Mattila's lab, and is now pursuing a thesis that focuses on the honey bees' waggle dance.

"When a worker bee comes back to the hive after foraging, she runs around excitedly trying to attract the attention of her sister workers. When she has their attention, she begins dancing in a figure-eight pattern," she said. "One way that foragers might attract the attention of other worker bees is by releasing pheromones, or chemical signals, from their abdomens as they dance."

For her thesis, Carr-Markell is investigating whether worker bees from different fathers produce different amounts of these chemical signals while they dance and if these differences affect the number of followers attracted. She calls honey bee communication strategies fascinating.

"Thousands of workers all live together and support each other without any authority directing their actions," she said. "They go out to forage, build the comb, take care of the brood, attend the queen, remove dead and diseased bees, circulate air through the hive, and, if necessary, give their lives to defend it."

Mattila, who joined the college in January 2009, is also collaborating with Christina Grozinger of Penn State University to study chemical communication during honey bees' swarming process. When honey bees swarm, half the colony leaves the nest with the queen and go through an intensive search for a new home. The bees have to move through the air together, always follow the queen and not get lost.

"We're going to look at the chemicals used in that process to determine how the colony stays cohesive when they're flying," said Mattila, as well as why some bees leave the nest and some don't. While Mattila has always been interested in animal behavior, she's always had a sweet spot for honey bees.

"Working with honey bees is amazing," she said. "You can learn so much about them, but they have so many mysteries left. We still don't understand how they work and why they do some of the things that they do." (Wellesley College News Release)

"BEST STUDENT PAPER" AWARD PRESENTED

Judy Wu was awarded "best student paper" for a presentation at the Florida American Bee Research Conference.

Judy Y. Wu received a Bachelor of Science degree in zoology from Humboldt State University, Arcata CA in 2005. She spent a year at the USDA–ARS Invasive Plant Research Laboratory in Fort Lauderdale, FL completing a Student Conservation Association internship where she conducted research on biological control agents (insects) targeting several highly invasive weeds. Judy began her Master of Science program at Washington State University, Pullman WA in 2008. She is currently completing her research on sub-lethal effects of pesticide residues in brood comb on worker honey bees and will be graduating May 2010.

STUDENT RESEARCH SCHOLARSHIP AWARDED

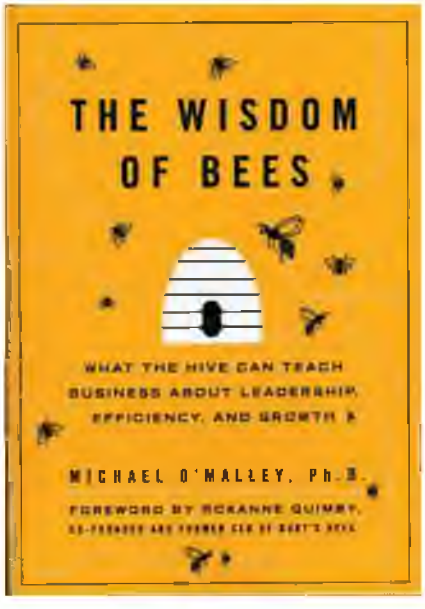
Geoff Williams received the AAPA Student Research Scholarship at the Florida American Bee Research Conference

Geoff Williams is a Ph.D. Candidate at Dalhousie University and Acadia University in Nova Scotia, Canada supervised by Dave Shutler, Dick Rogers, and Sandy Walde. For his thesis, he is investigating effects of the antibiotic Fumagilin-B® and the recently-detected fungal parasite *Nosema ceranae* on honey bee colony strength, while also studying effectiveness of this antibiotic on this parasite. His future work will investigate interactions between *Nosema ceranae* and western honey bees' historical Nosema parasite, *Nosema apis*, as well as compare pathology of these two parasites. In addition to his thesis research, Geoff has studied Varroa and deformed wing virus in honey bees, and has worked on a number of projects investigating potential effects of crop protection products on honey bee colony health.

Geoff has received numerous national and international awards for his work, including two NSERC Industrial Postgraduate Scholarships from the Government of Canada, the 2008 Canadian Association of Professional Apiculturists' Student Merit Award, the 2008 Eastern Apiculture Society of North America Student Award, and a 2007 Foundation for the Preservation of Honey Bees Scholarship. Since 2007, he has published 7 papers in peer-reviewed scientific journals, and he has presented his research findings at 15 local, national, and international scientific conferences and beekeeper meetings.

THE WISDOM OF BEES

When Michael O'Malley first took up beekeeping, he thought it would be a nice hobby and a good way to bond with his ten-year-old son. But as he started to observe these indutrious insects, he noticed that they do a lot more than just make honey. These tiny, buzzing creatures not only work together to achieve a common goal but, in the process, create a highly coordi-



nated, efficient, and remarkably productive organization. The hive behaved like a miniature but incredibly successful business.

In THE WISDOM OF BEES: What the Hive Can Teach Business About Leadership, Efficiency and Growth (Portfolio; May 17, 2010), O'Malley explains how bees can actually teach managers a lot about how to run their organizations. Among his twenty-five powerful insights are:

- Distribute authority: the queen bee delegates relentlessly, and worker bees make daily decisions based on local cues and requirements.
- Keep it simple: bees exchange only relevant information, operate under clear standards, and use straightforward measures and feedback to balance workloads.
- Protect the future: when a lucrative vein of nectar is discovered, the entire colony doesn't rush off to mine it, no matter how enriching the short-term benefits.

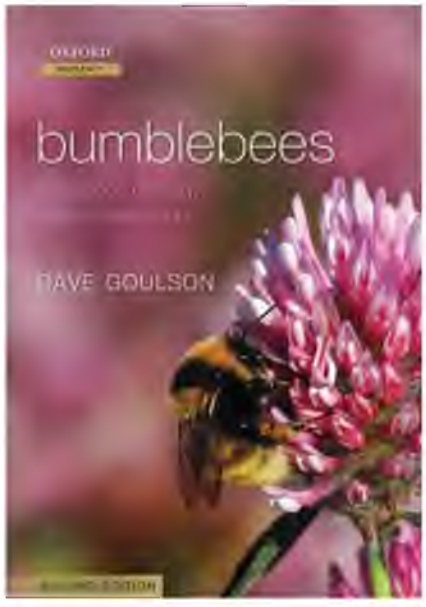
Blending practical advice with interstng facts about the hive, THE WISDOM OF BEES is a useful and entertaining guide for any manager looking to get the most out of his or her organization.

Michael O'Malley, Ph.D., is a social psychologist and management consultant who has coached some of the world's largest companies. He is currently the executive editor for business, economics, and law at Yale University Press and an adjunct professor at Columbia Business School. He has been an avid beekeeper since 2002. He lives in New Haven, Connecticut.

To be published by Portfolio, an imprint of Penguin Group, on May 17, 2010, Hardcover/$21.95//ISBN 9781591843269

BUMBLEBEES

Behaviour, ecology, and conservation



"Bumblebees are familiar and charismatic insects, occurring throughout much of the world. They are increasingly being used as a model organism for studying a wide range of ecological and behavioral concepts, such as social organization, optimal foraging theories, host-parasite interactions, and pollination. Recently, they have become a focus for conservationists due to mounting evidence of range contractions and catastrophic extinctions with some species disappearing from entire continents (e.g. in North America). Only by improving our understanding of their ecology can we devise sensible plans to conserve them. The role of the bumblebees as invasive species (e.g. . in Japan) has also become topical with the growing trade in commercial bumblebee nests for tomato pollination leading to the establishment of non-native bumblebees in a number of countries.

"Since the publication of the first edition of the book, there have been hundreds of research papers published on bumblebees. There is clearly a continuing need for an affordable, well-illustrated, and appealing text that makes accessible all of the major advances in understanding of the behavior and ecology of bumblebees that have been made in the last 30 years. *Bumblebees* is aimed at students, researchers, and interested amateaurs. Technical jargon has been kept to a minimum and sufficient background information given to enable anyone to follow the text without difficulty."

This is the second edition of this book, which was first published in 2003, ISBN 978-0-19-955307.5 (paperback). Published by Oxford University Press, www.oup.com.

NEW HIVE TOOL AND ACCESSORY BELT

Windsor, NY (February 22, 2010) - Beezerkbelts introduces two new innovative products created by beekeepers, for beekeepers.

Beekeepers Tool Belt

The Beekeepers Tool Belt has pockets to hold a queen marker, pen, Sharpie type marker, scissors and a queen cage. The primary feature is a magnetic holder that fits any style hive tool. No more looking in the grass or trying to remember where you laid your hive tool last.

Hive tools become too sticky to easily slide into a holster type tool holder. The magnets quickly and securely hold your hive tool, while also lessening the chance that you might poke yourself with the tool.

Made to last in the USA, the lightweight, washable tool belt is built with quality materials often used in backpack constuction. The fabric is 420 denier nylon pack cloth, known for durability, abrasion resistance, and being mold and mildew resistant. The adjustable 48 inch belt is long enough to go over your bee suit and sweater when working in cool weather. Note that the quick release buckle has a breaking strength over 200 pounds.

The Beezerkbelts Beekeepers Tool Belt is patent applied for. All Beezerkbelts products carry a limited lifetime warranty covering defects in material and workmanship. Available at **www.beezerkbelts.com**

ROB STOPPER

Keep the peace when your hives are open.

Beezerkbelts introduces the RobStopper mesh hive cover. It effectively stops robbing during hive inspection, and has simple and secure attachment. Also use it to protect stacked honey supers while working in the yard or while transporting them to the honey house.

The RobStopper is sized to slip over even the larger polystyrene hive boxes. It is made in the USA of durable nylon mesh that is washable, and it is mold and mildew resistant.

"I found myself hurrying my inspections, trying to reduce the threat of robbing from open boxes. I tried throwing a cloth or netting over the open boxes, but it slipped or blew off. By adding a sturdy elastic hem around the netting, it stayed put when I moved and stacked boxes. When I'm ready to put the hive back together, I can smoke down the bees through the mesh, and quickly slip the RobStopper off

RobStopper mesh hive cover

with one hand." says designer Sue Garing.

Sue Garing is a retired engineer living in Kirkwood, NY. She is working with fellow NY beekeeper Bob Talkiewicz, whose background includes design and marketing of high quality backpacking equipment.

Visit **www.beezerkbelts.com** for ordering information and more innovative beekeeping equipment.

MELLIFERA MILLINERY - CUSTOM COUTURE BEEKEEPING HATS AND VEILS©

Bobbie Meyzen, owner of Honey Bee Farm, LLC, located in Redding, Connecticut, has designed and created for this beekeeping season her delightful and functional "Mellifera Millinery Custom Couture Beekeeping Hats and Veils©" for the stylish beekeeper!

The Hats are available in two styles—

- Traditional Straw Pith Helmut or Straw Garden Hat.
- The Veils are Dark Tuile Netting.

Couture Silk Flowers (poppies, roses, sunflowers, hydrangeas, dahlias) and beautiful Ribbons come in custom varieties and colors made to each order's specification.

Samples of Hats are available at the Honey Bee Farm website at **www.HoneyBeeFarm.org**.

Photographs of completed Hats and Veils can be emailed to purchasers for approval prior to delivery for complete satisfaction. The price is $75.00 plus shipping (and plus 6% sales tax for orders sold in Connecticut.

BEEKEEPING INDUSTRY GATHERS IN ORLANDO TO "KEEP THE HIVE ALIVE"

The American Beekeeping Federation (ABF) hosted a huge turnout of over 850 people at the North American Beekeeping Conference & Tradeshow, Jan. 12-16, 2010, at the Wyndham Orlando Resort. The conference was billed as the meetings of the ABF and the Canadian Honey Council, but several other industry groups also held meetings during the conference, including the National Honey Packers and Dealers Association, Apiary Inspectors of America, Canadian Association of Professional Apiculturists and American Association of Professional Apiculturists (which held the American Bee Research Conference for scientific presentations).

The theme of the conference was "Keeping the Hive Alive," and many of the presentations focused on what is needed to accomplish that, beginning with the keynote address by Dr. Yves Le Conte, a world-renowned beekeeping scientist from France. He focused on the European beekeepers' battle to keep their bees alive despite an onslaught of insecticides.

Statistics cited by Dr. Le Conte included: 150-pound honey crops off sunflowers before farmers began using the insecticide Imidacloprid and 60-pound crops and empty (dead) hives afterwards; beekeepers in France were able to have the insecticide Fipronil banned in 2004 and reported improved crops and fewer losses. He also reported that European beekeeping scientists have formed a network to share research information.

A secondary focus of the conference was "keeping honey pure." Jill Clark of Dutch Gold Honey and Customs Investigator Mary Buduris teamed up for an hour-long presentation on the shadowy world of customs fraud and unscrupulous honey dealing. Clark reported that while the U.S. honey market remains strong and U.S. honey production has been declining, recorded imports of pure honey are also declining – facts that she found "a little strange."

Clark estimated that 800 container loads of honey mislabeled as some other product entered the United States in 2009. The products were labeled as honey syrup, blended syrup, malt sweetener, molasses and other products, she said. The advantage to the importer is that the product can be imported from China, but evades the antidumping duty assessed on Chinese honey.

Buduris, who works in the Chicago office of U.S. Immigration and Customs Enforcement (ICE), talked about the "fraud cycle" in which purchase, entry into the United States, payment and delivery all play a role. She quoted statutes and penalties of jail time that could await violators.

Buduris was joined at the podium by an ICE colleague from Houston. They said they have been working on customs fraud involving honey for nearly two years and indicated that there are ongoing investigations in several other cities. The agents cautioned honey buyers to do their due diligence in purchasing imported honey and to reject deals that seem "too good to be true." Both Clark and the ICE agents urged the audience to report suspicious offers to ICE at **iprcenter@dhs.gov**.

During the ABF Annual Business Meeting, several resolutions dealing with various aspects of honey import fraud and honey adulteration were adopted. After pointing out that "these illegal activities are threatening the financial stability of U.S. honey producers and packers," one resolution commends the work of the federal agencies involved in enforcing the law and encourages them "to work across agency boundaries with law enforcement colleagues at the local, state, and federal levels to bring an end to illegal honey transshipment." It also called for ABF to "work with other industry organizations to educate lawmakers on the extent of this problem and the negative effect it is having on the U.S. beekeeping and honey industry as well as on the food safety for U.S. consumers."

A second resolution called for ABF to continue to urge FDA to adopt, as the U.S. Standard of Identity for Honey, the Revised Codex Standard as submitted to the FDA and endorsed by the major industry groups. It also supports state efforts to adopt local honey standards based on the Revised Codex Standard. Florida and California have adopted honey standards and several other states are reportedly working toward adoption of their own honey standards.

A full copy of the 2010 ABF Resolutions, including the ABF Continuing Objectives and the Continuing Resolutions, is available on request from the ABF office. They are also posted on the ABF Web site at abfnet.org.

During the week-long event, David

Prize-winning honey at the ABF Conference

Honey queens at the ABF Conference

Mendes of North Fort Meyers, Fla., was elected ABF president and George Hansen of Colton, Ore., was elected vice president. Mendes was previously vice president; Hansen was a long-time member of the Board of Directors. New Directors joining the Board in Orlando are Becky Jones, of Farmington, Conn., and Davey Hackenberg, of Milton, Penn. The full list of the 2010 ABF Board of Directors can be found on the ABF Web site.

The ABF also recognized long-time member Liz Vaenoski, of Clinton, Wisconsin, for her outstanding and significant contributions with the 2010 President's Award. Vaenoski's artistic beeswax also received Best of Show – Related Items during the 2010 American Honey Show, and Stan Wasitowski of Fleming, New Jersey, Best of Show – Honey for his extra light amber honey. Finally, the ABF introduced the new 2010 American Honey Queen, Lisa Schluttenhofer, of Thorntown, Indiana, and the 2010 American Honey Princess, Amy Roden, of West Bend, Wisconsin.

Plans are already in full swing for the 2011 North American Beekeeping Conference & Tradeshow, Jan. 4-11, in Galveston, Texas. The event will be hosted by the ABF and the American Honey Producers Association. Be sure to check the ABF Web site often for the latest conference information.

NEW HAMPSHIRE

Charles Andros, former NH/VT Apiary Inspector, will hold a beekeeping workshop from 1-3:30 PM on Saturday, April 24, at 18 MacLean Road, Alstead, NH 03602. Look for the "BEE" sign on the south side of Walpole Valley Road. Topics of discussion will be early spring management: locating apiaries, equipment, handling bees, feeding syrup and supplements, making nuclei, reversing, and requeening. Bring a veil, if you have one, as we shall be opening some colonies. We'll be inside if it is a rainy day. Registration required. email: **lindena@sover.net** or call 603-756-9056.

VERMONT

Organic Beekeeping Principles and Practices

May 15-16, 2010
5/15 - 1:30 p.m - 6:00 p.m. (Optional beginner session at 9 am)
5/16 - 9:00 a.m. - 5:30 p.m.

This workshop covers topics suitable for small-scale commercial and hobby beekeeprs, with a primary focus on intermediate and advancd methods. For beginners, a special Saturday morning session that covers hive construction and layout, the basics of bee biology, and handling bees is strongly recommended. The rest of the workshop, Saturday afternoon/evening and all day Sunday, presents natural and organic beekeeping topics and practices not ordinarily covered in lectures and articles, including: presence and mindfulness in the beeyard; swarming as an expression of the bees vitality; working with swarms and making nucleus colonies; non-toxic mite and foulbrood control; apitherapy; overwintering, and an appreciation for the role that pollinators play within the Earth's ecosystem. Weather permitting, the day will be punctuated with visits to the hives, where techniques for handling bees are demonstrated with opportunities for hands-on experience by workshop participants. Bring a veil, if you have one.

Presenter: Ross Conrad, author Natural Beekeeping

Location: Metta Earth Institute, 2234 Geary Rd. South, Lincoln, VT 05443

Fee: $95 Includes snacks. Meals and lodging may be pre-arranged. Please call for more information. (802-453-8111 ask for Gillian)

To register call: 802-545-2396
http://www.dancingbeegardens.com/Workshops.html
http://www.mettaearth.org/classes.php4

CONNECTICUT

BackYard Beekeepers Association

April 27: David Tarpy, "The reproductive quality of commercial queens"

On Tuesday April 27, David Tarpy will speak on "The reproductive quality of commercial queens". He is the Associate Professor and Extension Apiculturist at North Carolina State University and will discuss his latest findings from his research. Meetings are at 7:30 PM in the Norfield Congregational Church in the Community Room on Norfield Road in Weston, Connecticut. At 6:30 PM 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 web site for the dates and locations or more information at **www.backyardbeekeepers.com** or contact Serge Boyce 203-259-4861 or **sergeboy@optonline.net** if you have any questions.

2010 BYBA General Meetings Program
May 25: Maryann & Jim Frazier "Pesticides on Bee Health and Behavior."
June 29: Dinner Meeting
September 28: Stan Schneider, Caste Interactions and Their Role in Colony Reproductive Decisions in the Honey Bee
October 26: Jennifer Berry, Sub-lethal effects of in-hive pesticides
November 30: Allan Hayes on his unusual beekeeping tools & gadgets
Workshop:
Saturday April 10: Hiving Package Bees: Dick Marron

NEW YORK

Apprentice Level Spring Course 2010

The Cornell University Master Beekeepers Program will conduct its two-day Apprentice Level Spring Workshop twice this year. New beekeepers and experienced beekeepers looking for a refresher course are encouraged to attend. Topics include the biology of the honey bee; starting with bees and beekeeping equipment; colony inspection; spring and supper management; and IPM for honey bee pests, parasites, pathogens and predators. Classes run from 9 a.m. - 6 p.m. and include 2 hrs. of field work each day. Cost is $140.00. A workshop manual and refreshments are provided. For registration meterials, go to masterbeekeeper.org. Classes limited to 24.

Offered at these times and places:

Sat/Sun, April 24-25
Betterbee
Greenwich, NY
Sat/Sun, May 1-2
Dyce Lab, Cornell University
Ithaca, NY

NEW YORK

New England Farms Beekeeping and Apiary Management Winter Seminar and Training Series

April 10, 2010 10:00 am - 3:00 PM
"Lunch with Mike Palmer"
10:00 AM, Nukes Aren't Just for Increase Anymore
12:00 noon, Buffet Lunch with Ross
1:00 PM, Wintering Nucs

Mike Palmer is a very successful commercial beekeeper and queen breeder. Mike will be discussing over- wintering nukes and "Nucs Aren't Just for Increase Anymore".

$25.00 per person, includes lunch and breaks, door prizes, a portion from each participant fee will be donated to the Vermont Beekeepers Association for the New Beekeepers Scholarships. Reservations are requested. Participants will also receive discounts from the sponsor on the day of the event. Seminar sponsor and location is New England Farms, 31 Main Street, Granville, New York 12832. 518-642-3270 email **newenglandfarms@aol.com**. See **www.newenglandfarms.com** for directions, reservations and discount information.

NEW YORK

Here is an updated list of organic beekeeping events at the Pfeiffer Center this spring and summer. PLEASE NOTE that the date for the summer workshop has

changed; it will be on June 19, not June 26. And we are delighted to announce that Ross Conrad will give an additional workshop on Apitherapy on June 20. This may be taken by itself, or in combination with the June 19 workshop for a 10% discount on both.

April 23-24, Chestnut Ridge, NY. Organic Beekeeping: Principles and Practices, with Ross Conrad and Chris Harp. For beginners and experienced beekeepers who wish to learn the most natural, holistic methods for caring for bees. Friday 4 pm - Saturday 6 pm, $185 (225with optional beginners session at 2 pm Friday). 845-352.5020 x 20 **info@pfeiffercenter.org** **www.pfeiffercenter.org**

June 19, Chestnut Ridge, NY. Summer Organic Beekeeping, with Ross Conrad. Focuses on seasonal tasks including working with swarms and preparing for the honey harvest. 9 am to 6 pm, $95 ($135 combined with June 19 workshop). 845-352.5020 x 20 **info@pfeiffercenter.org** **www.pfeiffercenter.org**

June 20, Chestnut Ridge, NY. Apitherapy: Health and Healing from the Hive, with Ross Conrad. Focuses on seasonal tasks including with swarms and preparing for the honey harvest. 9 am to 1 pm, $55 ($135 combined with June 19 workshop). 845-352.5020 x 20 **info@pfeiffercenter.org** **www.pfeiffercenter.org**

PENNSYLVANIA

The Capital Area Beekeepers' Association will conduct their 23rd Short Course in Beekeeping the first two Saturdays in May, 2010. The course is geared toward the beginner beekeeper, but will also benefit the experienced beekeeper.

Part I will be held on Saturday, May 1st, beginning at 8:00 a.m. at the Dauphin County Agriculture and Natural Resources Center, 1451 Peters Mt. Road, Dauphin, PA 17018. Part II will be held on Saturday, May 8th, beginning at 12:00 noon at Dave Anderson's Apiary, 7081A Colebrook Road, Palmyra, PA 17078. The cost for registration is $40 which includes a one-year membership in the Association.

For more information or a registration brochure, contact Jim Hoover 717-691-1413 or e-mail **Hooverdron@aol.com**

WEST VIRGINIA

Sponsored by: Cabell Wayne Beekeepers Association
Date: Saturday, April 10, 2010
Place: Heritage Farm Museum & Village, 3300 Harvey Road, Huntington, WV
Time: Registration 8:00 a.m. - 9:00 a.m.
Meeting 9:00 a.m. - 4:00 p.m.
Cost: Registration by March 26, 2010 $10.00 per person **Hot lunch included**
Registration at the door $10.00 but hot lunch is not guaranteed
Key Note Speakers:
Jerry Hayes - Apiary Inspection Assistant Chief for the state of Florida's Dept. of Agriculture & author of The Classroom in the *American Bee Journal*
Dr. Larry Connor - Popular lecturer and bee magazine author
Dr. Tom Webster - Bee Research Specialist with Kentucky State University
Bonus- Free Friday Night Guided tour of Heritage Farm Museum & Village—6:30 p.m. - 8:00 p.m.
After the tour - Meet the Speakers
Contact - Gabe Blatt 304-429-1268

OHIO

Latshaw Apiaries 2010 Instrumental Insemination three Day Course

Join us September 8-10, 2010, for the second annual instrumental insemination course taught by Dr. Joseph Latshaw. This course is designed to help individuals learn the *science* of instrumental insemination and the *art* of perfecting the benefits this valuable technique. The course will be limited to six participants to maximize the benefits of a small group setting. Ample opportunitites for individualized instruction and plenty of practice will be provided.

Dr. Latshaw has over 20 years of beekeeping experience and specializes in the design and production of instrumental insemination equipment. Dr. Latshaw has designed two insemination devices: the Latshaw Instrument and the new Latshaw Micro Instrument. Dr. Latshaw's insemination skills and his extensive background in honey bee genetics have allowed him to significantly contribute to the beekeeping community by providing exceptional breeder stock to commercial queen and honey producers across the United States.

Dr. Latshaw has hundreds of hours of teaching experience, and he is a frequently sought after speaker. Join him for this great opportunity to learn the instrumental insemination technique. Applications are required. Enrollment will be closed when the course is full. Please visit **www.LatshawApiaries.com** for additional information and an application. We look forward to working with you.

TENNESSEE

The Heartland Apiculture Society (HAS) annual conference will be held July 8-10, 2010 on the campus of Tennessee Technological University (TTU) in Cookeville, TN. For more information contact Jim Garrison, president of HAS at **jimg1850@live.com**, or go to the HAS website at **www.heartlandbees.com**

The Tennessee Beekeepers Association (TBA) annual convention will be held October 29-30, 2010 on the campus of Tennessee Technological University (TTU) in Cookeville, TN.

For more information contact Ray Turner, Exec. VP for TBA at **rturnerbee@wmconnect.com**, or Jim Garrison, president for TBA at **jimg1850@live.com**

MISSISSIPPI

Beekeeping Workshops/Shortcourses

April 6 in Jackson at the MS Ag & Forestry Museum ($10.00)
May 7-8 in Verona at the MS Ag & Forestry Experiment Station ($10.00)
May 14-15 in Jackson at the MS Ag & Forestry Museum ($10.00)
June 2-3 in Hattiesburg at the MS Extension Service Bldg. ($10.00)

Please contact Harry Fulton, P.O. 5207, MS State, MS 39762, fax to 662-325-8397 or email to **pixie@mdac.state.ms.us** or **harry@mdac.state.ms.us** If possible, please register two weeks in advance for a workshop, so we will know how many people to plan for.

ILLINOIS

Queen Rearing Course May 14-15, 2010

Every beekeeper can benefit greatly from raising their own queens. Join us at Long Lane Honey Bee Farms in Central Illinois on Friday and Saturday, May 14th & 15th for a two-day comprehensive queen rearing training adventure. On Friday we begin at 9 am with indoor presentations on queen rearing and grafting until lunch. After lunch each student will be led through the entire process of grafting, from the selection of the right aged larvae, transporting the frame to the grafting room, grafting and placing grafts into cell bar frames and placing grafts into the starter nuc.

On Saturday we begin at 9 am with indoor presentations until after lunch. In the afternoon we are in the field learning how to prepare starter nucs, a finishing hive and the use of the Cloake board and queen Castles. Then, at near the end of the class around 3pm, each student will remove their grafts from the day before for evaluation and will be given transport containers to transport their grafts home to be placed into a finishing hive. Dr. Stu Jacobson will be speaking as well. This is hands-on, so all beekeepers must bring a hat and veil or suit. Hive tools are provided. Lunch on Friday & Saturday is provided. Included in the course, each student will receive our booklet on queen rearing, a grafting tool, a three-frame wooden transport nuc, a cell bar, a cell bar frame and 20 plastic queen cells. Cost is $179 for the two-day course and the listed supplies.

OKLAHOMA

The Oklahoma State Beekeepers Association is having its Spring Conference April 10th at the Guthrie Fair Grounds (1201 South Division Street, Guthrie, OK) from 8:00 am to 4:00 pm. All beekeepers and all others interested in beekeeping are invited. We will have timely presentations on many aspects of beekeeping from members from all parts of the state. We are planning a shorter youth program to run at the same time as the main meeting.

For further information call Glen Brunette, Vice-President of the Oklahoma Beekeepers Association, at (405) 433-2362 evenings.

NEBRASKA

University of Nebraska Cooperative Extension

Everything You Need to Know to Succeed in Apiculture

Beginning Beekeeping Field Day
Ithaca, NE - April 17, 2010
10:00 AM - 2:00 p.m.

Preregistration is required. There is no registration fee for the Ithaca Workshop, and lunch is pot-luck, so bring a dish to share. If you have questions about the workshop or need further information, contact: Marion Ellis at:
Email: **mellis3@unl.edu**
Phone: (402) 472-8696

2010 Master Beekeeping Workshop
A Master Beekeeping Workshop will be offered in Ithaca, Nebraska at the Agricultural Research and Development Center Headquarters Building on June 10-12. This workshop will provide detailed instruction bee biology and practical beekeeping. Training will include both classroom and hands-on sessions. Registration for the workshop is $100 and includes 5 meals, a workbook, a cap and refreshments. The hands-on sessions will be in an apiary and participants should bring their own protective gear. For a complete program with schedules and a list of presenters contact Jeri Cunningham (contact and registration information provided below).

Send Master Beekeeping Workshop Registrations to:
Jeri Cunningham
University of Nebraska
Department of Entomology, 202 Entomology Hall, Lincoln, NE 68583-0816
Email; **jcunningham1@unl.edu**
Phone: (402) 472-8678
Make check to: University of Nebraska

NEW MEXICO

Hands-on Natural Topbar Beekeeping Classes with long-time beekeeper Les Crowder Certification Classes in Santa Fe, New Mexico April 25, May 16, May 23, June 20. Backyard Beekeeping in Albuquerque, New Mexico April 11, April 18, May 23. Backyard Beekeeping in Rio Lucio, New Mexico May 9, June 6. Out of Towner's intensive in Rio Lucio, New Mexico August 19-22. **www.fortheloveofbees.com** or email **fortheloveofbees@kitcarson.net** (575) 587-2065.

OREGON

GloryBee brings bees to the people on Bee Weekeend

GloryBee Foods has announced that their annual Bee Weekend will take place approximately the second weekend of April 2010. Bee Weekend is a two-day event filled with beekeeping education, distribution of pre-ordered packages of live bees, and lots of fun for veteran and beginning beekeepers alike. Dick Turanski, founder and beekeeper, will be on hand to demonstrate installation of package bees into hives. For more information go to **www.gloryfoods.com**

Record Poor 2009 U.S. Honey Production

United States 2009 Honey Production Down 12 Percent

Honey production in 2009 from producers with five or more colonies totaled 144 million pounds, down 12 percent from 2008. There were 2.46 million colonies producing honey in 2009, up 5 percent from 2008. Yield per colony averaged 58.5 pounds, down 16 percent from the 69.9 pounds in 2008, and is the lowest yield since 1989. Colonies which produced honey in more than one State were counted in each State where the honey was produced. Therefore, yields per colony may be understated, but total production would not be impacted. Colonies were not included if honey was not harvested. Producer honey stocks were 37.2 million pounds on Dec. 15, 2009, down 27 percent from a year earlier. Stocks held by producers exclude those held under the commodity loan program.

Honey Prices Record High

Honey prices increased to a record high during 2009 to 144.5 cents, up 2 percent from 142.1 cents in 2008. U.S. and State level prices reflect the portions of honey sold through retail, cooperatives, and private channels. Prices for each color class are derived by weighting the quantities sold for each marketing channel. Prices for the 2008 crop reflect honey sold in 2008 and 2009. Some 2008 crop honey was sold in 2009, which caused some revisions to the 2008 crop prices. *(Courtesy USDA-NASS)*

Honey: Price by Color Class, United States, 2008-2009

Color Class	Price					
	Co-op and Private		Retail		All	
	2008	2009	2008	2009	2008	2009
	Cents per Pound	*Cents per Pound*	*Cents per Pound*	*Cents per Pound*	*Cents per Pound*	*Cents per Pound*
Water White, Extra White, White	138.9	140.8	195.0	272.1	141.2	142.3
Extra Light Amber	135.2	141.7	209.7	242.4	140.7	146.1
Light Amber, Amber, Dark Amber	127.4	133.6	240.5	275.6	142.0	144.6
All Other Honey, Area Specialties	143.3	138.5	326.8	394.8	205.9	217.8
All Honey	135.4	139.2	224.7	278.4	142.1	144.5

Honey: Number of Colonies, Yield, Production, Stocks, Price, and Value by State and United States, 2009[1]

Honey: Number of Colonies, Yield, Production, Stocks, Price, and Value by State and United States, 2009 [1]

State	Honey Producing Colonies [2]	Yield per Colony	Production	Stocks Dec 15 [3]	Average Price per Pound [4]	Value of Production [5]
	1,000	*Pounds*	*1,000 Pounds*	*1,000 Pounds*	*Cents*	*1,000 Dollars*
AL	9	49	441	66	182	803
AZ	20	52	1,040	562	153	1,591
AR	24	57	1,368	301	139	1,902
CA	355	33	11,715	2,109	139	16,284
CO	28	53	1,484	326	140	2,078
FL	150	68	10,200	1,428	138	14,076
GA	65	41	2,665	346	147	3,918
HI	10	95	950	323	163	1,549
ID	103	46	4,738	1,706	145	6,870
IL	8	34	272	57	226	615
IN	9	32	288	101	198	570
IA	26	42	1,092	339	151	1,649
KS	9	63	567	164	189	1,072
KY	5	35	175	25	273	478
LA	37	103	3,811	610	132	5,031
ME	6	50	300	51	186	558
MI	66	60	3,960	1,505	151	5,980
MN	122	65	7,930	1,427	140	11,102
MS	14	104	1,456	87	132	1,922
MO	11	47	517	57	198	1,024
MT	146	70	10,220	3,577	145	14,819
NE	48	56	2,688	1,102	144	3,871
NV	10	52	520	57	129	671
NJ	9	32	288	46	193	556
NM	7	60	420	143	163	685
NY	47	65	3,055	978	183	5,591
NC	11	45	495	84	252	1,247
ND	450	77	34,650	7,623	137	47,471
OH	11	50	550	132	275	1,513
OR	55	34	1,870	767	149	2,786
PA	21	40	840	319	199	1,672
SD	270	66	17,820	6,237	139	24,770
TN	7	51	357	86	235	839
TX	74	63	4,662	886	138	6,434
UT	26	38	988	198	147	1,452
VT	5	49	245	69	236	578
VA	6	39	234	56	328	768
WA	62	44	2,728	1,064	149	4,065
WV	5	37	185	33	267	494
WI	63	60	3,780	1,588	151	5,708
WY	37	48	1,776	391	143	2,540
Oth Sts [6 7]	15	51	768	127	280	2,150
US [7 8]	2,462	58.5	144,108	37,153	144.5	208,236

1 For producers with 5 or more colonies. Colonies which produced honey in more than one State were counted in each State.
2 Honey producing colonies are the maximum number of colonies from which honey was taken during the year. It is possible to take honey from colonies which did not survive the entire year.
3 Stocks held by producers.
4 Average price per pound based on expanded sales.
5 Value of production is equal to production multiplied by average price per pound.
6 CT, DE, MD, MA, NH, OK, RI, and SC not published separately to avoid disclosing data for individual operations.
7 Due to rounding, total colonies multiplied by total yield may not exactly equal production.
8 Summation of States will not equal U.S. level value of production.

World Honey Market

UNITED STATES

An unusually cold, wet winter has been hard on colonies over much of the country. As this was written in early March, beekeepers were using a break in the winter to check outyards. What some were finding was not a pretty picture. We have heard of losses of up to 50% from a number of beekeepers. Even in the traditionally mild Southeast and Southwest areas, beekeepers had to fight cold, rainy weather well past normal. This has made early buildup for package bee, nuc and queen production very difficult. The season will obviously be delayed by at least a couple weeks. Also, some producers will not be able to supply as many bees and queens as they had hoped. This, added to the high winter losses in the northern United States, has caused a number of producers to book up on orders earlier than normal.

Only the northwestern United States seemed to be spared Mother Nature's wrath this winter. On the other hand, the silver lining from all the rain and snow has been much improved soil moisture and reservoir levels over many dry parts of the country. In fact, some parts of California had already suffered devastating flooding and mudslides. Residents in the East Central and West Central areas were bracing for what could be a very wet spring with possible flooding along major rivers.

The world supply of honey is expected to improve slightly in 2010, according to some forecasters. Many major honey-producing countries had poor honey crops in 2009. In fact, the United States registered its poorest crop on record, even below 2008's record poor honey production. According to the yearly USDA-NASS honey estimate, only 144 million pounds of honey were produced, down 12% from 2008. The world honey supply is expected to remain tight for the next year, except possibly for Chinese honey, which seems to find its way to this country, one way or another. Most sources believe honey prices will remain strong. Local honey will continue to be a hot item in 2010 and supplies will remain short.

NORTHEAST—Bitter cold and regular snowstorms kept winter very much on the minds of beekeepers through February and the first part of March. By the first mild days of March, beekeepers were braving the deep snow to check for colony survival. Mixed reports are coming from beekeepers. While some indicate that the colder weather has reduced stores consumption, others have said that the prolonged cold weather prevented lateral cluster movement, thus starving many colonies in the midst of plenty.

With all the moisture available for plant growth, spring and summer flows could be excellent if colonies are populous and temperatures are warm. Unfortunately, some beekeepers may be too busy repopulating deadouts to worry about spring flows. Supplies and delivery times for package bees, nucs and queens are a concern since a colder than normal early season has put package bee and queen producers behind schedule. In addition, much warmer weather will be needed to allow normal bee foraging weather. As this was written, maples and other early tree sources needed a few warm days before they could bloom and provide the first new pollen and nectar for 2010.

Most beekeepers were sold out of honey until the new crop starts coming in. Honey demand remains strong.

MIDEAST—As weather finally began to warm in March, beekeepers were playing catch-up trying to prepare their colonies for early spring flows. This will be a big job since many colonies perished during the prolonged cold periods during this harsh winter. Beekeepers were busy feeding and will try to make early divides to recoup their hive numbers. Package bee and queen deliveries may be problematic, however, since the cold weather has also delayed the southern bee season.

Soil moisture conditions have returned to normal throughout the area and if the weather cooperates, beekeepers could have excellent spring and summer honey flows. Much will depend on the colony strength, however, since many of the best flows in this area come in May and early June. Domestic honey continues to be scarce, so little trading is taking place.

SOUTHEAST—The start of the season was about two weeks late in coming. Even after maples, willow, and wild fruit trees blooms were available, periods of cold, rainy weather continued to delay bee build up and beekeeper work. Package bee and queen producers have had an especially tough time building bees up and in many cases had to feed extra amounts of syrup to supplement available nectar and pollen sources. Demand is strong for package bees, nucs, queen cells and queens. A number of producers have told us that they are either already booked up or will be shortly.

Moisture conditions are good, but plants needed more warm weather. In some cases, the earlier freezes did some damage to orange groves in Florida. However, other reporters said that they felt flows in their area were not damaged by the freeze, but that warmer weather was needed during the actual bloom. The late almond season in California may affect orange and other early honey production since some migratory beekeepers may not be able to return to Florida as early as they had hoped.

As we indicated last month, little honey remains available, so few sales are taking place. Buyers are actively seeking to lock in crops and prices for new crop orange, gallberry, palmetto and tupelo honey.

SOUTHWEST—Good rains have helped spring honey flow prospects over much of this area. However, the prolonged cool weather also held back colony development and bee work. Winter bee losses were also higher than normal. Some beekeepers and package bee and queen producers said that they were running a couple weeks late. Bees were working early tree sources like maple, elm, oak, pine and cedar. In addition, dandelions were starting to bloom, as well as wild and domestic fruit trees. The first major flows will come from wildflowers and shrubs, often called "brush" areas. In addition, along the Gulf Coast Chinese tallow should begin blooming and it normally provides significant amounts of honey. Beekeepers don't have any honey left to sell, but packers are making higher offering bids on honey crops that have not materialized yet in order to secure future inventories.

EAST CENTRAL—It's been a tough winter for colonies in this area. Many beekeepers have reported large winter colony losses. In some cases, starvation is blamed, but in a number of instances clusters died

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. Blk.	$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	$1.25-$1.60
Amber lb. Blk	$1.25-$1.60	$1.20-$1.75	$1.20-$1.50	$1.20-$1.60	$1.35-$1.75	$1.20-$1.60	$1.25-$1.50	$1.20-$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.	$.96-$2.50	$1.00-$2.25	$.89-$2.50	$.90-$2.25	$.95-$2.75	$1.05-$2.50	$.99-$2.20	$1.00-$2.75
Squeeze Bear 12 oz.	$1.89-$3.50	$2.00-$3.75	$1.75-$3.20	$1.40-$3.25	$1.99-$4.45	$1.59-$3.75	$1.55-$3.50	$1.50-$3.60
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-$5.00	$2.70-$5.25
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-$6.75	$4.25-$6.00	$3.50-$6.00	$3.58-$6.50	$3.25-$5.50	$3.50-$5.50	$3.75-$6.00	$4.75 $7.00
Jars 3 lb. (Quart)	$5.50-$9.75	$5.95-$15.00	$5.79-$10.00	$5.25-$9.25	$5.00-$11.50	$4.50-$10.00	$5.10-$9.75	$5.00-$10.50
Jars 4 lb.	$7.50-$9.25	$5.00-$10.00	$7.00-$8.75	$6.00-$9.70	$8.00-$12.00	$5.50-$13.00	$6.00-$9.00	$5.95-$9.25
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-$18.00
Creamed 12 oz.	$2.50-$4.25	$2.50-$4.00	$2.49-$3.20	$2.25-$3.99	$2.00-$3.90	$1.99-$4.00	$1.75-$3.75	$1.75-$3.85
Comb 12 oz.	$3.00-$5.00	$2.50-$5.00	$2.25-$4.25	$2.50-$5.50	$2.50-$4.75	$2.50-$5.50	$2.50-$4.75	$2.75-$5.50
Round Plas. Comb	$3.00-$5.50	$2.25-$4.50	$2.50-$4.00	$2.00-$5.25	$2.25-$4.99	$2.00-$5.50	$2.25-$5.00	$2.50 $5.50
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.	$1.70-$3.50	$1.70 -$2.75	$1.70 -$3.00	$1.70 -$2.50	$1.70 -$2.50	$1.70 -$2.50	$1.70 -$2.50	$1.70 -$2.50
Dark per lb.	$1.60-$3.00	$1.60 -$2.35	$1.60 -$2.25	$1.60 -$2.25	$1.60 -$2.25	$1.60 -$2.25	$1.60 -$2.25	$1.60 -$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.

amidst plenty of honey. Beekeepers surmise that the prolonged, extremely cold weather prevented clusters from moving to the new honey stores. A number of beekeepers were feeding in March. The deep snow prevented access, except by foot or snowmobile in some cases. Where outyards had numerous dead colonies, beekeepers were able to simply move the hive bodies and supers full of honey from the dead colonies to surviving colonies. This provided a ready and easily accessible source of food to surviving colonies as they began their spring buildup. Ground moisture conditions are above normal due to all the earlier rain followed by heavy snows.

Maples, elms and other early pollen sources were slow in blooming this March due to the prolonged severe cold weather. However, a break in the weather in early March gave colonies a good cleansing flight and allowed beekeepers to begin checking colonies. Some beekeepers were adding pollen supplement patties because they felt colonies did not yet have access to a plentiful supply of early natural pollen. Demand for package bees, nucs and queens is expected to be very heavy again this year. Unfortunately, reporters were telling us that they were already encountering some difficulty is lining up orders due to the heavy demand.

Demand for honey remains excellent, but little local honey remains unsold. Wholesale prices are expected to increase again this season as packers scramble for new inventories.

WEST CENTRAL—Many commercial beekeepers still had the bulk of their bees in California or in a southern state for buildup. However, these colonies will be returning to clover and alfalfa honey production locations this month. This has been a rugged winter for overwintering in the West Central area due to prolonged extreme cold weather, often accompanied by strong winds. Bees overwintered indoors or provided with winter packing seem to have done much better in these extreme conditions since clusters were looser, allowing bees to move laterally to new stores.

Many beekeepers were just opening their first colonies to survey the situation as this was written. Mixed reports are coming in—some beekeepers report average or excellent overwintering, while others report devastating winter losses. These losses will need to be recouped with splits, nucs or packages, so demand for replacement bees and queens will be heavy again this season. Some reporters blame varroa or viruses, but many others call this an old-fashioned hard winter that we haven't had in quite a few years. With poor honey flows last season, many colonies went into winter ill-prepared for any kind of winter. Early bee work will be difficult due to deep snows in some locations. In addition, muddy roads and localized flooding may also be a problem once temperatures begin to warm. If the weather is nice this spring, clover and alfalfa growth is expected to be excellent due to the abundant ground moisture.

Wholesale and retail honey demand are good, but domestic stocks are mostly exhausted. Prices are expected to continue to increase this year.

INTERMOUNTAIN—Most commercial beekeepers had taken their bees to California for almond pollination and later pollination work for fruits and berries. Most will be returning to their home honey production locations sometime this month or early next month before clover and alfalfa begin to bloom. Beekeepers who leave their colonies on location have experienced a fair to good winter. Cleansing flights have come on a fairly regular basis. Beekeepers were just beginning to peek into hives in March and will also begin spring feeding and other bee work as the season progresses. Package bees and queens should be in good demand as beekeepers replace deadouts and start new colonies. According to our reporters, a number of new beekeepers are also starting, if attendance at short courses and bee meetings is any indication. Beekeepers had sold most of their honey before the beginning of 2010.

WEST—Earlier rainy, windy weather made bee movement into the almond groves difficult at times. However, the rainy season was letting up some, so that bees had more foraging time. Along with almonds, bees were working numerous wildflowers including borage, wild mustard, bottlebrush, etc. Other beekeepers had

moved their colonies into the orange groves for honey production, but we had not heard how much honey the orange flow had produced. Pollinators also will be moving their bees on to apples, plums, pears, etc., as the season progresses. With all of the rainy weather, soil moisture and reservoir conditions are rated as much improved over last year. This should not only promote better row crop production, but many wildflowers that traditionally produce excellent honey crops should be available in abundance this season. These include manzanita, sage, buckwheat and star thistle.

After many beekeepers had contracted their bees for almonds at $10 to $20 less than last year due to rumors that fewer bees would be needed, the situation changed dramatically. Many commercial beekeepers had heavy fall and winter colony losses, so they were not able to supply as many colonies as they had hoped. In addition, almond prices rebounded on the world market causing growers to show renewed interest in producing a maximum crop by having adequate pollination. Also, good rains and snow in the mountains eased irrigation water restriction fears. These factors all came together in early 2010 and resulted in a net shortage of perhaps 100,000 colonies, according to some reports. Some desperate growers offered $20 to $40 more over the going rate for strong colonies in order to obtain bees before their almond bloom began. Others relented and accepted "culls" with only a few frames of bees in order to provide some pollination.

ARGENTINA

Although by early March the honey crop should be over in most of Argentina, the intense showers of February (the highest on record since 1906) may help offset the results of a mediocre crop. Beekeepers located in the delta region of Buenos Aires and Entre Ríos provinces might reap the benefit of extended levels of ground moisture, along with migratory producers now located in the eucalyptus region of northeastern tropical Argentina.

However, for beekeepers located in the prairies, the 2009/2010 season will again be remembered as a poor honey season. Unlike last year, when severe drought conditions besieged beekeepers, this season unusually rainy days hampered honey harvest prospects.

El Niño weather conditions will continue at full strength until late May 2010. Because of bad roads, beekeepers in Argentina are seriously concerned about their chances to harvest their remaining honey crop, as well as to their chances to complete timely varroa treatments and supplemental feeding. One additional issue of concern is the huge increase in the price of bulk sugar, which is now 73% higher than one year ago.

According to recent trade statistics that were just released, during the period January – February of 2010, total Argentine honey exports were 6,548 metric tons, which sold for US$19.15 million. This translates into US$2,924 per MT. The current tonnage represents a 16% lower volume exported at a 12% higher price than exports of January – February of 2009 (7,815 MT exported for US$20.3 million). Although, most sources agree that this season's crop will be higher than last year's harvest, available export figures indicate the opposite so far.

The first bimester exports of 2010 also show an interesting trend. USA imports were 130% higher (1,730 MT) over purchases made during Jan. – Feb. 2009 (751 MT). This is compatible with the short crop in the USA, along with the higher demand for honey worldwide. Germany decreased its imported volume from 3,685 MT during 2009 to just 2,943 MT during 2010, but it still keeps the same market share of 43% of total Argentine exports. Exporters complain of the declining exchange rate for the EURO, but they also acknowledge that the revaluation of the U.S. dollar facilitates their shipments to the USA.

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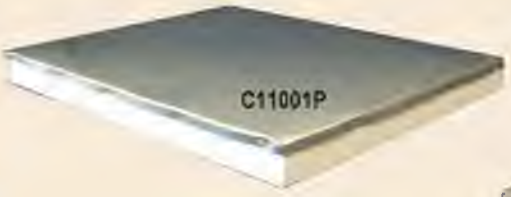

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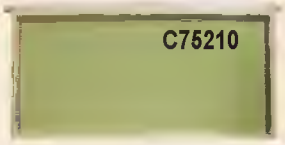

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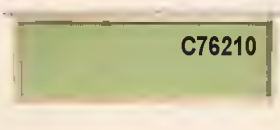

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International Honey Market

by RON PHIPPS
President, CPNA International Ltd.[1]
Co-Chairman,
Committee for the Promotion of Honey and Health

North America

In the U.S. official numbers on the 2009 crop have come out, showing that it was only 144,000,000 pounds, the lowest ever recorded. The yield per colony was 58.5 lbs., which represented a decline of 16%. How much of this decline was due to weather or condition of bees is not clear. The number of colonies increased to 2.4 million, an increase of 5%. Despite that increase, total honey production decreased. At the end of December 2009, stocks were 37.2 million pounds, which represents a very substantial decline of 27% from December 2008. North Dakota was the biggest producer with 35 million pounds. South Dakota was second with 18 million and California fell to 12 million, probably as a consequence of the protracted droughts. Older inventories were sold and the recent crop is largely sold and delivered. The 2010 crop prospects are more promising due to the abundant winter rains and snows.

Beekeepers remain concerned about the health and vitality of their bees. This is not due merely to mites and Colony Collapse Disorder, but to a general decline in beekeepers, stress on bees, reduction of land for honey production and the impact of increased use of pesticides on corn, soybeans, citrus groves, etc. Modern migratory beekeeping practices are increasingly suspected to put high levels of stress upon bees. Moving bees in mid winter when bees are weakest over vast distances and subjecting worker bees to mono-diets may contribute to stress levels that are too burdensome for maintaining vigorous and large bee populations. Studies at São Paulo University in Brazil have shown how even the very vigorous Africanized bees respond poorly to darkness and noise, both encountered during late winter migrations. Because of such concerns, many beekeepers did not move their bees from east to west to pollinate the almonds recently. Pollinating fees remained strong as supply of bees was below demand, despite reduction of the planting of almond trees due to concerns about the adequacy of water supplies for California farmers competing with California's large urban and suburban populations. So, the rains of 2010 have been doubly welcomed thus far.

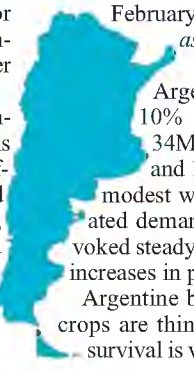
Argentina and South America

Given the short USA and Canadian 2009 crops, coupled with complete depletion of older inventories from previous crops, attention has focused upon Argentina's 2009/2010 honey crop. This is especially significant for white honey since it is white honey that is experiencing the most significant international shortage. Due to the poor Argentine 2008/2009 honey crop, no meaningful carry-overs existed by late 4th Quarter 2009.

Through December, the northern Argentine Provinces, where the honey crop begins due to greater proximity to the Equator, suffered extensive drought which delayed and reduced the overall crop. But by January, ample rains came to Las Pampas and Buenos Aires Province. These rains were mingled with regular sunshine and optimism resumed. Crop estimates grew to 70,000-80,000 metric tons.

However, rains turned excessive. Buenos Aires had in mid-February unprecedented rains. This was largely due to the El Niño phenomenon, which in turn led to torrential rains in both Argentina and Brazil. The same fundamental weather patterns affected the USA. I was spending a week at Claremont University in mid-January during which time we witnessed incessant rainfall. In 1 week, 20" of rain was predicted, when 14" annual rainfall is the norm. By February, many American beekeepers pollinating the almond groves had considerable difficulties moving bees in and out of the muddy groves. In Peru, tourists were evacuated due to mudslides. The high evaporation rates from the warm Pacific caused tremendous snowstorms that affected the Midwest and the entire east coast of the USA. Both China and Europe have also experienced unusual snow through the first two months of 2010. As a consequence of deteriorating weather conditions in Argentina, the estimate for the current crop has been reduced to 50,000-60,000 metric tons.

Given the unprecedented rainfall in mid-February, the lower estimate of 50,000 metric tons is regarded as more realistic. If so, that will make the current Argentine crop turn out even smaller than the small USA 2009 crop! In general, Argentina's crops from the north were very bad, central and western areas had poor crops and the central and southeastern crops are more or less normal. The significance of the rains in Argentina is manifest in an AP article of February 22, titled *"Grain prices rise as rain hits Brazil, Argentina."*



The distribution of colors in Argentina is now estimated to be 10% white 25MM, 20% white 34MM, 30% 50MM, 30% 65MM and 10% darker than 65MM. This modest white honey crop has accelerated demand for white honey and provoked steady, and in some cases dramatic, increases in prices.

Argentine beekeepers with poor or bad crops are thinking the only path for their survival is with an irrationally high surge

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Report distributed March 1, 2010

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in prices. The beekeepers with normal crops are cognizant of the overall situation and are selling honey in only small quantities to cover immediate costs while "waiting for higher prices." Of course, they may miscalculate and wait too long, given the fact that the abundant rains and snows covering California and the Midwest could portend a bigger North American honey crop in 2010. The wild card variable of circumvented and cheap Chinese honey still looms large over the American honey market. In any case, Argentine honey prices are likely to remain firm. In January, about 2,500MT were exported with an additional 3,500-5,000MT expected to be exported in February. From March through June it is expected that Argentina will be able to export about 5,000MT monthly. The overall global economic difficulties may, in the final analysis, restrain the Argentine beekeepers' ambition to achieve the historically high prices that they seek.

Demand from Europe remains robust. Indeed, the delay in exports of honey due to the short early crop, has only made pent up European demand increase. Though the Euro has weakened a little relative to the US dollar, European buyers still enjoy a currency advantage of about 35% over North American buyers. The basic prevailing parity between the US and Canadian dollars has made Canadian honey much more expensive in U.S. dollars for American packers in 2010 than was the case in 2009. Thus, more Canadian honey is staying home and will continue to do so unless prices for Argentine white honey get out of sight.

The political and economic situation in Argentina is very tense and fragile. Inflation is returning and some Argentineans fear, as they put it, that "Argentina, despite its vast resources, is becoming a non-competitive country."

To illustrate the strength of the market south of the border, Mexican light amber honey is being sold at $1.55 C&F European ports, and Brazilian organic white honey is now over $1.75/lb. Ex-dock USA. Prices, like fish, are jumping.

It remains too early to estimate the Brazilian honey crop, but some indicate that the quantity of export to the U.S. is anticipated to be similar to 2009. There was no rain, however, for 20 days in February, and there is concern about the lack of honey in the hives.

For Chile and Uruguay, the preferred and traditional market is Europe, whose currency sustains high US Dollar prices. The tragic earthquake in Chile will undoubtedly result in delays for exports from that region.

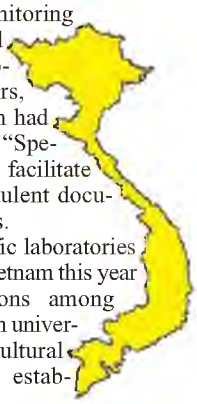
Currency relations will undoubtedly influence honey's absolute prices and the relative advantages of Europe vs. the U.S. in procurement of South American honey. The national debt problems in Greece, Portugal and Spain have put downward pressure on the Euro relative to the U.S. dollar. This makes the U.S. marginally more attractive than it was several months ago for South American exporters. However, the cumulative national debt in the U.S. still portends, in the view of many economists, to a further weakening of the U.S. dollar and increasing commodity prices.

Vietnam and Asia

As this market report is being prepared, the Vietnamese honey crop is barely beginning. Vietnamese beekeepers are transitioning from wintering their bees, feeding their bees and protecting them from disease.

At the end of January, an important meeting was held in Hanoi between the Vietnamese Beekeeping Association, various ministries of the Vietnamese Government and agents of I.C.E. As reported previously, the Vietnamese have taken very proactive and strict steps to prevent circumvention. It is important that both governments work together to prevent circumvention.

Several years ago, Vietnam established Special Economic Zones where Chinese and Taiwanese companies established offices. Some of these companies have left Vietnam and one is reported to be under investigation by Interpol. As Vietnam has established a strict monitoring program for authorized beekeepers, honey factories and honey exporters, several companies which had "front or shell offices" in "Special Economic Zones" to facilitate circumvention via fraudulent documents are out of business.



Officials from scientific laboratories in Europe have visited Vietnam this year and cooperative relations among Vietnamese and American universities with strong agricultural departments have been established.

The phenomenon of circumvention is troubling not only to our U.S. industries and our Congress, but also to China. Chinese officials in The World Trade Organization must try to negotiate issues and agreements that both open and integrate international markets and follow the rule of law. The widespread phenomenon of circumvention is a major hindrance and obstacle to implementing the rule of law in international trade.

Circumvention

During the recent conventions of the American Honey Producers Association and the American Beekeeping Federation, much discussion occurred regarding the global shortages of honey and the continuing concern about circumvention. Officials from U.S. Homeland Security spoke in Orlando to both the National Honey Packers and Dealers Association and the American Beekeepers Federation (ABF) about their efforts to stop the widespread practice of circumvention in its various forms. Many American packers, beekeepers and importers spoke with the officials, informing them of the details they encounter in the competition between "legal" versus "illegal" honey. In Sacramento, Jill Clark, from

Dutch Gold and President of the National Honey Board Association; Bruce Boynton, executive director of the National Honey Board (NHB); Richard Adee of the American Honey Packers Association (AHPA) and this author all gave speeches which discussed this phenomenon and its serious impact upon the NHB, members of the NHPDA, AHPA and ABF.

Evidence was presented in formal and informal meetings from scientific laboratories specializing in honey about analysis of honey that was ultra-filtered to remove telltale pollen, adulterated with rice syrups. These tests also revealed the presence of Chinese pollens in honey ostensibly produced outside of China and contaminated with improper residues. The ultra-filtration of honey removes both pollen and veterinary drug residues, providing a "disguise" of the phenomenon of circumvention of Chinese honey through third countries. It is, however, relevant to note that the FDA prohibits sales of ultra-filtered honey as honey.

The buzz among beekeepers was that the situation is comparable to the Madoff Ponzi Scheme, wherein for a decade, the evidence that something was wrong in the "State of Denmark" accumulated in the Securities and Exchange Commission. Only the financial crisis caused decisive action and conviction against Madoff. What will it take for a decisive, timely and comprehensive solution to be effected to prevent circumvention of Chinese honey in order to avoid paying prevailing antidumping fees on Chinese honey? American beekeepers and American packers are increasingly asking this question.

The situation has been compounded by the fact that as of this writing, Congress has failed to: 1) renew suspension of the bonding privilege allowing importers to post bonds rather than pay cash deposit for antidumping liabilities and 2) impose duties on the honey portion in the so-called "packer's blend." The termination of the suspension of "bonding privileges" ended in summer, 2009.

The deeply partisan paralysis in Congress has thus far stymied all efforts to re-impose the requirement of cash-deposits. This failure has re-opened the door to direct imports of Chinese honey mediated by "front companies" that evaporate if, and when, U.S. Customs comes to collect antidumping duties retroactively. It, therefore, remains an urgent goal of the AHPA to persuade Congress to promptly reclose this loophole.

All, however, is not quiet on the front to stop circumvention of honey. There is a report that about 200 containers of honey exported to the USA in 2009 were denied entry. A small number of these containers were returned, but the overwhelming majority are in a state of limbo. According to the reports, this honey was accompanied by fraudulent country of origin and quality certificates. The ostensible exporters quite naturally did not accept responsibility for the shipments and would not accept return. The parties in the country that actually produced the honey would not accept return of the honey since such would entail admission of creating and submitting forged documents. We note that there has been increased scrutiny of agricultural products shipped from Asia to the USA. For example, hundreds of containers of various products were rejected by U.S. authorities and returned to India, Indonesia and Malaysia in 2009.

There are also reports of some honey exporters being put on automatic detention by the U.S. FDA. That means the honey must arrive in the USA, be sampled and tested and proved free of actionable contaminants as a condition for release. Because of this type of action, various companies have ceased exporting to the USA. It is predicted that 2010 will witness various exporters going out of business as their illegal actions catch up with them.

Of course, the dilemma and tragedy is that honest exporters, importers, packers and beekeepers may also go out of business if they are forced to compete with circumvented honey much longer.

In respect to the efforts to stop circumvention, there are several positive developments. Firstly, commercial laboratories and independent academic scientists have greatly increased their ability to detect and expose the various "disguises," such as ultra-filtration, pollen addition, and adulteration with a multitude of sweeteners, which are being employed to hide the reality of circumvention. Secondly, more statistical academic and governmental data is at hand to reveal that certain alleged countries of origin do not produce the quantity or quality of honey that show up as surges of honey from new honey-exporting nations. Thirdly, through the efforts of packers all over America, more retailers and manufacturers realize that large price differentials for processed honey and aberrational chemical profiles for honey are not signs of business acumen, but illegal circumvention. Retailers and manufacturers increasingly realize through the concerted efforts of American packers throughout the country that collusion to circumvent antidumping duties impose upon them criminal liabilities. Fourthly, more American packers and American beekeepers are reaching out to their Congressional Representatives and Senators to persuade U.S. Customs to devote more resources so that a thorough and timely end of the phenomenon of circumvention is achieved.

Nonetheless, 2009 saw continuation of aberrational export patterns to the USA. For example, in 11 months, imports from Malaysia were over 17,000,000 pounds at values averaging $0.72/lb. for ELA, and 835,000 pounds of ELA came in from Mongolia at values in the range of $.62/lb. Documents exist that show that Malaysia produces only a tiny fraction of that volume and Mongolia has no ability to produce honey for export. In contrast, many newspaper articles reveal the convoluted paths by which Chinese honey has been circumvented through third countries.

While some packers believe that they are faced with the dilemma of either participating in buying circumvented honey or going out of business, most honey packers are actively cooperating to fight the corruption and fraud to which others feel compelled to submit.

Conclusion

In conclusion, there has been renewed talk in the American honey industry, especially among American honey packers, of the need to make adjustments to assure continuity and adequacy of supply. Given several factors including 1) the international shortage of honey, 2) the increased vicissitudes of global weather patterns, 3) the prevalence of circumvention to avoid antidumping duties, 4) the vulnerability of bee populations and 5) the likely end in this decade of China's treatment in antidumping cases with surrogate country analysis, many packers are concluding that there should be a renewal in one form or another of some agreement that could impose both quantitative restrictions and minimum prices on Chinese honey and other products subject to anti-dumping orders. The prevailing political climate, including the intense and widespread opposition to the fraud which is at the heart of circumvention of Chinese honey, makes establishing a new agreement extremely difficult.

The growing sentiment among packers, however, is that they cannot have confidence in adequate supply to serve a market that consumes 400 million to 500 million pounds of honey annually, if the world's biggest producer of honey has no legal access to the American market. China's absence is creating stress and has helped divide the market into 2 tiers – a legal and an illegal market. Suppression of the illegal market has proved to be very incomplete and tenuous. If domestic production remains stagnant and far below consumption, pressure will continue to build to eliminate circumvention by finding a legal mechanism that will allow access to Chinese honey, but which will concurrently suppress both dumping and flooding of honey.

In addition to the impact of tariff trade barriers, non-tariff trade barriers are also exerting influence upon and are dangerous to the honey market. At every beekeeper's convention, anywhere in the world, discussions are dominated by the effort to develop methods to protect bees. In 95% of the world's bee yards, beekeepers engage in methods to protect their bees. The reason is that bees, like other forms of life, are vulnerable to disease and stress. If bees existed in a mythical realm of invulnerability, and if the plants bees pollinate existed in a sister realm of invulnerable botanical life forms, then there would be no need to devise methods of preserving the health and vigor of bees. However, due to the universal vulnerability of animal life, food products, including honey, do not dwell in a realm of ultra-purity. It is this fact that makes it essential to find reasonable testing limits and reasonable tolerance levels for residues. The macro-environment of rain, atmosphere, soil and pesticides also are expressed as residues in food products. The key question is how to balance and integrate effectively protecting bees and ensuring the safety of honey and other bee by-products. Other food industries have long recognized similar needs and been able to effectively and realistically address the dual concerns of protecting agricultural production and human safety.

It will not do to adopt a sectarian attitude that says in effect, "I can have my residues, but you can't have yours." Given the inexorable move toward global economic integration, establishing global science-based standards, testing limits and tolerance levels will become imperative if consuming nations are to ensure adequacy of supply and continuity of quality. Testing methodologies have become hyper-sensitive, promising to detect and measure parts per ten billion or per trillion. But the issue is not "testing the test" but ensuring 1) protection of the ability to produce the food supply and 2) safety for food consumption. The world's bees, it is realistic to estimate, are crucial to global annual production of over $100 billion dollars of food. It is this context that impels global science to create global standards. Realism must prevail over mythology, sound science over harmful illusions.

There must be cooperation in this effort to establish standards. The global integration we witness entails greater integration of economies, science and law. If issues of both tariff and non-tariff trade barriers are not addressed, the honey market will become increasingly unpredictable and efforts to guarantee adequacy and continuity of supply and quality will become ineffective. The current global shortage of honey compels us to think about all these issues from a more strategic and long-term perspective.

Given the current global economic recession and high rates of unemployment and underemployment, there are obvious and real restraints on how high honey prices can rise. Reducing or removing tariff and non-tariff trade barriers will become a strategic requirement to ensure both adequacy of supply and reasonableness of price. If, as we hope, the creative use of good science as a marketing tool to promote the health benefits of honey matures, then ensuring adequate supply to meet growing demand will become even more challenging.

What Transshipped Honey is Doing to the U.S. Honey Market and What You Can Do About It!

Courtesy of Richard Pasco on behalf of the Honest Honey Initiative
McLeod, Watkinson & Miller
One Massachusetts Avenue, N.W.
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As beekeepers, honey packers, and importers our challenges seem to grow faster than we can produce honey. The ever-evolving and complex schemes devised to enter honey into our market without paying the U.S. antidumping duty on Chinese honey imports is mind-boggling, to say the least. Our attempt in this article is to shed additional light on the subject, so we are better able to fight this very real threat to our future in the bee business.

1. U.S. import statistics highlight the honey laundering problem

Let's start with what we know about imports. USDA Honey Market News data shows the U.S. imported less than 200,000 pound of honey from China in 2009, after being the largest U.S. honey supplier before imposition of the Chinese antidumping duty in December 2001.

Record levels of honey are now being imported into the United States from India, Vietnam, Thailand, Taiwan, Malaysia and Indonesia. These last three countries do not have commercial beekeeping industries, so these countries do not have the capacity to produce and export 35.5 million pounds of honey to the United States in 2008 or any year.

The average price of honey from Thailand, Taiwan, Malaysia, and Indonesia is about $0.75 per pound. Compare this price to the honey from the U.S., Canada, Argentina and Brazil and the reality that it costs about $1 per pound to produce honey normally. Also curious is the fact white honey is now being shipped to the United States from Vietnam, which is a country that does not produce white honey

Transshipment of Chinese-origin honey through other countries is not the only problem. Chinese shippers and others are also mis-describing honey as blended syrup, honey syrup, and malt sweetener to avoid paying the antidumping duty.

In both 2008 and 2009, at least 80 million pounds of Chinese-origin honey entered the United States each year without paying the anti-dumping duty. This means that uncollected duties totaled $200 million in lost revenues for the U.S. Treasury for this two-year period.

In 2008, 35% of all U.S. honey imports entered our market without payment of the antidumping duty. In 2009, circumvented honey imports grew to 44% of total imports.

2. The impact of transshipments on all honey segments

Increasingly sophisticated honey import schemes are creating drastically diverging market prices. There is now one price for legitimate honey and another rock bottom price (which is sometimes available at ½ the cost of legitimate honey) for transshipped honey. This trade makes it almost impossible for honey packers who refuse to purchase this transshipped product to compete against those who are engaged in this activity. Additionally, the unfair competition is detrimental to the legitimate honey importer segment of the honey industry.

Honey laundering undermines the credibility of the entire honey sector, since the image and reputation of honey as a safe and wholesome product is put into question. Such schemes mean there is greater risk of adulterated honey products being sold as pure honey in the U.S. food chain with increased potential of residues entering the U.S. food supply, since Chinese honey has been found to contain a variety of antibiotics.

The honey laundering trade undermines the image and reputation of honey among U.S. consumers. This illicit trade opens the honey industry to questions of commercial fraud, food safety and security. Clearly, consumers and food manufacturers are also being cheated as this practice spreads.

3. Department of Homeland Security and U.S. Attorney Offices are continuing to investigate and charge those who support and participate in illegal activities

Commercial fraud is a serious crime of interest to U.S. Attorney Offices across the U.S. Potential violations of Food and Drug laws on adulteration and misbranding carry stiff penalties on top of embarrassing indictments for those companies that are charged with such misdeeds. The Department of Homeland Security is continuing to investigate and U.S. Attorneys are continuing to prosecute those who support illegal honey laundering activities.

In May of 2008, two Chicago executives of a German-based food company (i.e., Alfred L. Wolff) were arrested for allegedly conspiring to illegally import honey from China that was falsely identified as coming from other countries to avoid antidumping duties. According to the government complaint, the company imported honey into the U.S. valued at almost $30 million since 2005. U.S. Customs and Border Protection (CBP) agents tested samples of honey whose shipping documents indicated they were produced in Russia, and the lab results

showed that some of the samples contained honey produced in China. The complaint noted that when Immigration and Customs Enforcement (ICE) agents searched the company's Chicago office, they seized documents that showed the company had sold an adulterated shipment to an unidentified company in the U.S. at a discount rate.

Federal authorities have also pursued other schemes, including the activities of Chinese nationals and importers to defraud the United States with false paperwork used to hide Chinese-origin honey. On August 19, 2009, Boa Zhong Zhang (a citizen of China) pled guilty in U.S. District Court in Seattle, to "conspiracy to enter goods in the United States, and introduction of adulterated food into interstate commerce." Mr. Zhang was a 20-year employee of a bee products company in China, who was arrested on May 6, 2009 in Los Angeles, while traveling in the U.S.

Chung Po Liu, an importer from Bellevue, Washington, was also arrested on May 6 and his trial is forthcoming. According to the complaint filed the case, LIU (through his two companies) is alleged to have purchased honey from China, and then had it shipped to other countries where it was relabeled to make it appear it was a product of these other countries.

More recently, on Oct. 29, 2009, the U.S. Attorney for Chicago announced that the "president of a honey manufacturer in China" (i.e., Yong Xiang Yan) pled guilty "to conspiring to illegally import Chinese honey." Mr. Yan is now awaiting sentencing by the judge in U.S. District Court sometime this spring and faces a maximum financial penalty of $3.9 million and a few years in prison.

4. Support efforts to rid the honey industry of fraudulent imports

It is our duty to help our government officials ensure that imported honey in safe, legal and properly labeled as to country of origin. Your support of efforts to combat fraudulent Chinese honey import practices could make a difference in our on-going viability as beekeepers. The adverse affects of this trade on legitimate businesses who ethically source honey will not be stopped without the concerted involvement of us individually and collectively.

CBP and Food and Drug Administration (FDA) officials have occasionally intercepted containers of questionable honey, but we need these federal agencies to step up their efforts. In this regard, we ask that you write to your Senators and Representative in Congress about fraudulent honey imports and urge them to press FDA, CBP and ICE officials to enhance their focus on this issue.

To help combat this trade on a transactional basis, we encourage you to report suspicious activity (including the sale of imported honey at dramatically reduced prices) to ICE at 1-866-DHS-2-ICE or at **iprcenter@dhs.gov**

CBP should also be contacted to report antidumping or mis-description of goods violations by going online and completing a three-step form at: **https://apps.cbp.gov/eallegations/allegations.asp**. To remain anonymous, you can simply ignore step one (which asks for your contact information) and provide information on the alleged violation in step 2 and the alleged violator in step 3.

To ensure the integrity of the honey sector, it is critical that you do not buy transshipped honey that is offered to you and report those who attempt to engage you in this activity to ICE and CBP. ICE and CBP agents continue to closely watch honey shipments, but any additional specific and timely information that you can provide them will aid their investigations and lead to further convictions.

Concerned Honey Industry Members

American Bee Journal Editor

THOMAS G. NEWMAN

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

In the previous article of this series entitled "Rev. W. F. Clarke and Mrs. Ellen S. Tupper," we indicated that in the January 1874 issue of the *American Bee Journal* Thomas G. Newman became manager of the beekeeping magazine, and that its publication was taken over by the American Printing Company, owned and operated by him. This company had offices both in Chicago and Cedar Rapids, Iowa. Starting with the cover of the April 1875 issue, Thomas G. Newman & Son are listed as publishers, with the *Journal* being printed at Cedar Rapids, although the names of Clarke and Tupper appeared on the masthead through the May 1875 issue.

The July 1875 issue stated on its cover: "Chicago, Ill., Thomas G. Newman, publisher, 196 & 198 South Clark Street." In the same issue,[1] appeared the following that is quoted in part: "Finding it to be absolutely essential that we should give our personal attention to the Chicago office, and there superintend the rapidly increasing business of our general Publishing House, we have arranged matters with reference to this change, which takes place *at once*.

"Our son takes the general management of the Iowa office, with all the details of practical work, leaving the way clear for the change above referred to."

The skep design cover that had been used ever since consolidation with the *National Bee Journal* appeared through the May 1876 issue, and the address of the *Journal* office then was changed to 184 Clark Street, Chicago, Illinois. The April 1876 cover contained a wood cut of the building at the corner of Clark and Monroe Streets, with a large "American Bee Journal" sign over its offices (see woodcut reproduction in the March issue.) This cover was changed with the April 1877 issue when a design showing two 1-pound jars of liquid honey with comb honey between was adopted.

In the November 1877 issue,[2] Newman announced the movement of the office of the *Journal* to the west side of Madison Street, No. 974. The *Journal* still was being published at this address when, in the December 1880 issue, Newman made the following important announcement.[3]

"This issue of THE AMERICAN BEE JOURNAL closes the volume for 1880, and calls for a few remarks. So far it has existed only as a monthly JOURNAL, and as such gained an enviable reputation and influence. Its visits to thousands of homes all over the world had been greeted with enthusiastic *welcome*, and its teachings on the all-absorbing subjects of "bees and honey," have been as anxiously looked for as they have been essentially adopted by apiarists not only in every State, Territory and Province in North America, but also in Europe, Asia, Africa, and Australia.

"Neither war, pestilence, financial depression, partial failure of crops of honey, nor the foolish jealousies and merciless abuse of evil disposed persons, has been able to materially hinder its steady *onward* course. From year to year it has increased the number of its pages to give its thousands of readers and correspondents an opportunity to participate in an interchange of thought and fully discuss the various topics of interest that are ever and anon presenting themselves to the apicultural world for investigation and decision.

"Still its capacity is too limited to accommodate all its correspondents, and its monthly issues are too infrequent to satisfy the longing for intercousre found in its many patrons, and to solve vital scientific questions frequently arising in the management of an apiary which require a more speedy solution. We have therefore determined to celebrate the twentieth year since its birth, by further enlarging its capacity and issuing its *weekly* . . . .

"Each weekly issue will contain more than half the amount of reading matter heretofore given in the monthly—thereby *more than doubling its capacity!*

"In order to publish the JOURNAL at a price so low as to be within the reach of all, it becomes necessary to assume the popular form of weeklies, enlarging the size of its pages, so that each one will contain more than *three times* the amount of reading matter on those of this size. . . .

"The WEEKLY will be published every Wednesday, and mailed on that day to every subscriber, for $2.00 a year, postage included; six months for $1.00; three months for 50 cents; making it within the reach of every beekeeper. When bank bills are not available, postage stamps may be sent.

"Each number being complete in itself, will be fully indexed; therefore, those who desire to take only a monthly, will be furnished the number published on the first Wednesday of each month, for **50 cents a year**.

"Those wishing it semi-monthly, can have the numbers published on the first and third Wednesdays of each month for **$1.00 a year**.

Thomas G. Newman, manager and later the editor of the *American Bee Journal* from 1875-1892.

***Former *American Bee Journal* editors**

"By this *elastic plan*, all may be accommodated who desire to invest 50 cents or more in a bee paper."

Thus, beginning with the January 1881 issue, the size of page was changed from 6 by 9 ¼ inches to 10 by 13 ½ inches, and was published as a weekly, but with the January 1882 issue, the page size was reduced to 7 ½ by 10 ¼ inches. During most of 1882, the *Journal* was offered only as a weekly, and there is noted that the office of the *Journal* was moved to 925 West Madison Street, Chicago. In the Nov. 29, 1882 issue appears the following:[4]

"At the request of many who have heretofore taken the Monthly and Semi-Monthly BEE JOURNAL, we shall next print a Monthly consisting of 32 pages, issuing it about the middle of each month, at $1.00 a year . . . . The Weekly and Monthly BEE JOURNALS will be distinct papers, each having its own sphere of operation and different readers. . . ."

During 1883 and 1884, the weekly issues were published in a page size 7 ½ by 10 ½ inches at $2.00 a year, and the monthly issues were published in a page size 6 by 9 inches at $1.00 a year. What a publishing problem that must have been! Newman, however, continued this through 2 years, but with the end of 1884 approaching, he made the following announcement:[5] "We have decided to publish the MONTHLY BEE JOURNAL for next year of the same size and shape as the Weekly, (which contains about the same amount of reading matter as the present Monthly), at 50 cents a year."

Starting with the 1885 Volume 21, the offices were enlarged and the address now was 923-925 West Madison Street, Chicago, and the July 1885 issue[6] reads: "**Thomas G. Newman & Son** will publish the AMERICAN BEE JOURNAL hereafter. The editorial department will be conducted, as heretofore, by Thomas G. Newman, and the business department by Alfred H. Newman. The firm will (as before the division, 5 years ago today), carry on the business of publishing the BEE JOURNAL, books and pamphlets, and keep for sale the usual assortment of bee-keepers' supplies."

Then, a "Special Notice" appears in the Nov. 4, 1885 issue that reads in part: "On January 1, 1886, the price of the Weekly BEE JOURNAL will be reduced to to *One Dollar a Year*. This we have contemplated for some years, and only awaited the proper time to warrant us in issuing the Weekly BEE JOURNAL at the very low price of *one dollar* a year. That time has now come. We shall continue to improve the BEE JOURNAL, and it will maintain its proud position as the leading bee-paper of the World!" Thus, through 1890, Volume 26, the Journal was published only as a weekly.

However, in the Feb. 1, 1890 issue, appears this announcement:[7] REMOVED. "For years we have been looking for a more convenient location. We secured such on January 1st, and hereafter we will be found *in the heart of the business portion of the city*—AT 246 EAST MADISON STREET

After being editor for a year, Newman decided to feature a woodcut of the Chicago *American Bee Journal* office on the cover

(Top floor—Take elevator)—where our friends can drop in and see us without making a journey to do it."

During 1891 through 1894, the page size was changed to 6 by 9 inches and two volumes were published in each year. Volumes 27 through 30, each had 26 issues except for Volume 30 which had 27 issues. In the July 16, 1891 issue, Newman announced:[8] "We have leased a more commodious quarter, and hereafter may be found at 199, 201, 203 EAST RANDOLPH ST., where we shall be pleased to see any friends who may call on us."

But the March 31, 1892 issue listed Thomas G. Newman, editor; Geo. W. York, assistant editor; and carried this important announcement:[9] "**The Editor's Health** has been so much impaired by three annual attacks *La Grippe* [now called influenza or the flu], that if some radical improvement is not made very soon, a collapse is iminent. His physician prescribes 'a complete rest and change of air.' Accordingly, he will leave the city next week for a month's rest. The drudgery of desk-work has brought on neuralgia and brain troubles. A vigorous constitution and strong will-power have contributed in no small degree to his holding out so long against the insidious work of that dire disease and its results.

"Meanwhile, the editorial work on the BEE JOURNAL will devolve upon the Editor's assistant, Mr. George W. York, who has been connected with the office for sereral years, and is thoroughly conversant with the duties of that department."

While Newman was away,[10] a fire destroyed the printing office and bindery where the *Journal* had been printed and bound during the past 15 years, but the day after the fire, the Womans' Christian Temperance Union made their largest press available to the *Journal*. Thus the May 26, 1892 issue was published on time.

The June 2, 1892 masthead lists Thomas G. Newman and George W. York as editors, and the cover reads "Published weekly by George W. York & Co." It also contains an important notice by Thomas G. Newman:[11] "We have this day (June 1, 1892) sold the AMERICAN BEE JOURNAL, together with the printing office, 'good will,' accounts, etc., to George W. York & Co., who will continue its publication, as heretofore, at the same location, and we commend them to all our friends, bespeaking for them a continuation of that liberal patronage so long bestowed upon us. They will fulfill all unexpired contracts and receive all subscriptions now due."

Thus, the *American Bee Journal* was continued under the guidance of George W. York. Alfred Newman's name ceased, with the same issue, to be listed as business manager, but the name of Thomas G. Newman continued to be listed as joint editor through the Sept. 29, 1892 issue.

Thomas Gabriel Newman[12] was born on Sept. 26, 1833, near Bridgewater, Somerset, England. He was left fatherless when 10 years of age, with three older brothers and a sister, the mother being a penniless widow because of his father's endorsing for a large sum. The boys, consequently, all had to go to work, and Thomas chose the trade of printer and book binder, serving an apprenticeship of 7 years. At the age of 20, he married and with his wife and mother, whom he then was supporting, came to Rochester, New York, and within hours obtained a steady job with the *American* paper. Within 2 months, he took the position of assistant foreman on the *Rochester Democrat*, then a leading paper of western New York. Later he spent 7 years editing and publishing "Bible Expositor and Millenial Harbinger," and published a score or more of theological works, some written by himself.

At the close of the Civil War, he started a newspaper. In 1866, he sold his publishing interests and, for a "rest," he took his wife and three children to England where his wife's mother was very ill. After her death, he returned this time to Cedar Rapids, Iowa, where he published *The Illustrated Journal*, a literary serial printed in the highest style of the art at that time.

The story of Newman's association with the *American Bee Journal* has already been told. Of his purchase of the *American Bee Journal*, Dr. Miller said:[12] "For a man not afflicted with bee-fever, in cold blood to pay more than $2000 for the simple 'good will' of a paper with no printing office or supplies of any kind, shows an unbound confidence in the future of bee-journalism. Few men under the same circumstances would have achieved his success."

Apparently, during his years as manager, he applied himself to the study of practical apiculture, increasing his original three colonies to more than 100 in 1879, when he

disposed of them because the bees were troublesome to surrounding stores. However, Newman was exceptionally active in beekeeping organizations and affairs for many years afterwards.

According to Milum,[13] in 1877, Newman was elected secretary of the North American Beekeepers' Society in a meeting held Oct. 16-18, in New York, and was elected its president the following year. At that meeting in New York, Oct. 8-11, 1878, Newman was appointed to represent that orgainzation at European Bee and Honey Shows, a trip he made at his own expense, winning several gold medals for his exhibits of American apiarian implements. In 1879, he reported on his trip and was re-elected president.

On Sept. 14-15, 1880, beekeepers of Northwestern States met in Chicago for the purpose of forming a permanent society. A constitution was adopted and Newman was elected its treasurer. During the sessions of the North American Beekeepers' Society at Detroit, Michigan, Dec. 8-10, 1885, the National Beekeepers' Union was formed and Newman was named its General Manager. The stated purposes were to promote the interests of beekeepers, protect their rights and to defend and secure favorable court decisions. The Union did not hold meetings, conducted its business largely by mail, and reported its activities at the annual meetings of its sister organizations. Newman performed an outstanding task in this capacity, and remained its manager until both organizations were amalgamated early in 1900 as the National Beekeepers' Association.

In taking over the editing and publishing of the *Journal*, York[14] paid the following tribute to Newman:

"Having known Mr. Newman so intimately for so many years, and also being so closely connected with editing and publishing the AMERICAN BEE JOURNAL, we know something of the prodigious amount of toil and energy that he bestowed upon it. It is today the result of almost a life work.

"Nearly 20 years of constant thought, effort and attention has Mr. Newman given to the BEE JOURNAL and the best interests of the pursuit of bee-keeping; and now, having won lasting victories and well-merited laurels through his noble and energetic writings and deeds, he places in other hand his 'loved child,' which he has so tenderly and carefully guarded and protected during a score of years."


THE AMERICAN
BEE JOURNAL
Vol. XIII. CHICAGO, ILL., MAY 15, 1878. No. 22.
THOMAS G. NEWMAN & SON.
CORRESPONDENTS.

This cover appeared in one of the last issues before Newman turned over editorship to George York

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Honey Bee Biology

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Innovations That Led the Langstroth Frame to Its Full Potential

Profound innovations often need refinements and modifications to become truly useful. That's what happened to the movable frame, a momentous revolution in apiculture.

In October of 1851, the Rev. L. L. Langstroth struck upon the fundamental idea. Enclose a comb in a wooden frame leaving a three-eighths inch gap between it and the sides, floor and top of the hive. The bees would leave this passageway open, neither filling it with propolis for being too narrow nor comb for being too wide. The bee space, as it came to be known, allowed inspection of individual combs, forever divorcing beekeepers from the drudgery of cutting combs from the hive. Centuries of that collective misery were banished from most parts of the beekeeping world by his careful observation, insight, and practical problem solving.

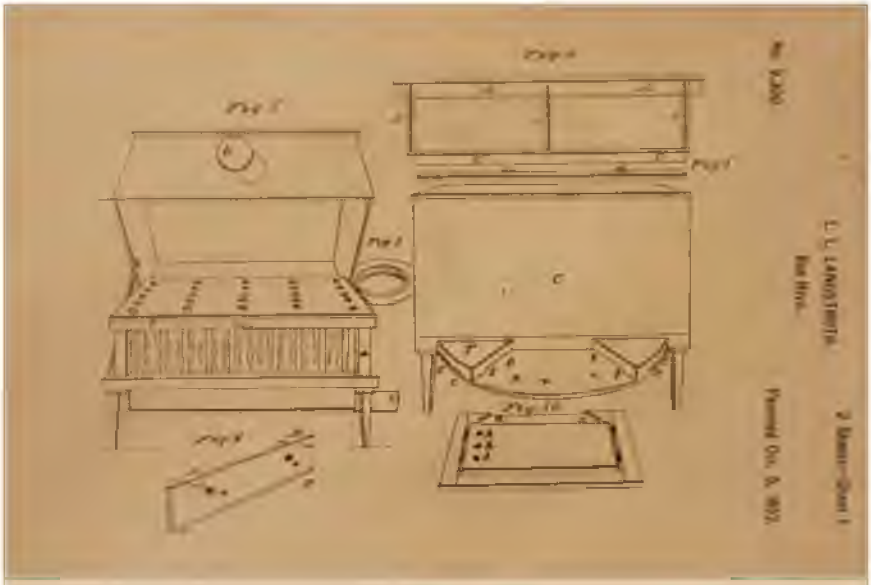

Figure 1. A picture from Langstroth's patent. The frame is at the upper right. The semicircle is the alighting board and the pie-shaped pieces are his wax moth traps. Bees built honeycomb in jars (not shown) that were placed over the holes covering the frames of the hive to the left.

Langstroth secured a patent by the following October of a hive with movable frames (patent number 9,300). Even though the bee space idea was an exceedingly simple idea, compared to the typical beehive patent, Langstroth's was about twice as long. There were other components besides the movable frame included in his patent: double glass hive walls, a device to trap wax moths, and honey receptacles (see Figure 1). In 1853, the first edition of *Langstroth on the Hive and the Honey-Bee, a Beekeeper's Manual* was published. In this now rare edition, Langstroth described the bee management benefits of his hive with movable frames. He also offered to sell individual or farm rights for others to build his hive. Or assembled hives could be ordered from him directly.

Unfortunately, the movable frame hive did not bring Langstroth the financial reward it should have. Others violated the patent by making their own frames. In addition, the Langstroth frame needed modifications. As originally conceived, the Langstroth frame was not self-spacing. The beekeeper had to manually space out the frames. No doubt, a time consuming task.

On the modern frame, the wide shoulders on the end bars automatically space the frames, and the top bar of the frame has straight sides, so *only* the end bars provide the spacing. Julius Hoffman, who immigrated from central Europe and resided near Canajoharie, New York, invented this labor-saving, automatic spacing frame. However, what he originally invented is, well, not

Figure 2. Comparing an original Julius Hoffman frame to a standard one. The old frame was 12 inches deep by 10 and three quarters inches wide. (The standard frame has comb made out of metal, but that's another story.)

quite what you see today. Figure 2 shows one of his *original* frames. This frame is extraordinarily rare. I only have one, and know of no other. Hoffman's old-style design was more complicated than the simplified version made today. The ends of the top bar are wide like the wide shoulders of the end bar, and *both* provide the spacing (see Figures 3 and 4). While Hoffman's top bar is wide at the ends, it is narrow towards the middle. When the top bars were side-by-side, the bees could move between them.

This scallop-sided top-bar would be more complicated to make than the straight-sided ones manufactured today. Nevertheless A. I. Root included instructions on how to cut the "paddle-shaped" ends of the top bar in the "Hive-Making" section of his 1891 edition of the *ABC of Bee Culture*. Prudently, he warned readers that these saw cuts were somewhat difficult and dangerous to make with a foot-powered saw. He recommended using a steam power saw with the proper cutting knives. (The Hoffman reference is not in the 1888 edition *ABC of Bee Culture*.)

The production life of the Hoffman frame with the old-style top-bar flickered only for a short time. Root, who founded the A. I. Root Company in Medina, Ohio and at one time was a large producer of bee supplies, offered that style for sale in the July, 1891 catalog. For the previous year, 1890, Hoffman frames were not in the January or August catalog. By 1892, Root had changed the design, advertising the modern straight-sided top-bar frame, spaced only by the end bar. I even found such an advertisement in *The American Bee Keeper* for March 1892, which was a competitor journal to Root's *Bee Culture*. So as best as I can tell, Root made the old-style Hoffman top-bar for perhaps a year. There's a little more I can add to the history of the progenitor of our standard frame, and *The American Bee Keeper* is the link.

That periodical was published by the W. T. Falconer Company located in Jamestown, New York. The Falconer Company also manufactured an extensive line of beekeeping supplies (see Figure 5). I wondered, would a more local connection to Hoffman, a New York beekeeper, render longer life to his original style of top bar? The answer seems to be yes. In the 1888 Falconer catalog (my earliest) was a picture of the original frames (see Figure 6) with the comment, "Having had considerable call for this style of frame, we have concluded to keep them in stock." The frame could be purchased in the standard brood frame size (like we use today), nailed together, for 2&3/4 cents per frame. Of my catalogs, the frame was shown in 1890, 1892, and 1894. The latter two years also displayed the modern Hoffman (straight-sided) top bar frame. Their transition to the modern style had begun. By 1896 it was over. The old-style Hoffman top-bar had vanished from the Falconer pages, apparently losing too much local support as beekeepers switched to the coming standard, the Hoffman spacer that dominates today.

The other major obstacle with the early Langstroth frame was getting the bees to build straight combs in it. Today that problem has been solved with full sheets of comb foundation. By the most widely known account, foundation had not been invented by the first (1853) edition of Langstroth's book. In 1857 Johannes Mehring from Germany made foundation from wooden flat plates with the negative hexagonal pattern carved in them[1]. Mehring's foundation however lacked sufficient projections for the starter cell walls

Figure 5. The W. T. Falconer Catalog for 1890. The Simplicity hive, so prominently stated below the firm's name, was the old name for the standard-size hive still in use today.

necessary for bees to accept the foundation. Consequently, the bees built much drone comb on the foundation, though it did provide a method for obtaining straight combs[2]. Less well known is a claim by Edward Kretchmer, a bee supplier in Iowa starting in 1864. His father made foundation in Germany in 1843 by rolling a beeswax-coated cloth through embossed rollers[3]. Nevertheless, it took time for these ideas to spread, and also for the price and quality of foundation to become acceptable to a larger segment of the beekeeping industry. Meanwhile beekeepers had to innovate mostly without foundation.

In his patent, Langstroth recommended attaching small pieces of worker comb under the top bar with melted wax, using that comb as a starter. Or if comb was not available, he recommended pouring a line of melted beeswax down the center of the lower side of the top bar. Later on, still making hives that did not rely on foundation, manufacturers redesigned the lower side of the top bar itself. The central idea was to give the bees a starting *edge* for them to begin comb construction. One method was to cut a groove down the middle of the top-

(l) Figure 3. The top bar of an original Hoffman frame (top). Notice the wide ends of the top bar, which obscure the end bars. (r) Figure 4. Comparing an original Hoffman end-bar (top) to a standard one. The end of the top bar is the same width as the spacer of the end bar.

Figure 6. Old-style Hoffman frames in The W. T. Falconer Catalog for 1888. See how they are drawn in a proportion suggesting the standard-size Langstroth frame. If beekeepers needed another size frame, as they often did before standard sizes dominated, the Falconer Company would cut them, but they had to charge a higher price.

Figure 7. Two old-style frames. The upper one has the wood strip, and the lower one has the V-shaped top bar. Note both frames have straight-sided end bars. These are not self-spacing frames. Every time the beekeeper put them back in the hive, these frames had to be manually spaced out – correctly.

bar and insert a small wood strip. The bees could start the comb from the protruding edge of the strip, sometimes called a comb guide. Another method was to bevel cut the top bar into a "V" running along its lower side. Or a V-shaped wood strip was nailed under a flat-sided top bar (see Figure 7). In the old beekeeping slang, these were called "triangular top bars." In the next article, we will examine some problems with these two methods of comb placement that have returned from the pages of history to perplex some beginning top-bar hive beekeepers. For now though let's close by remembering Langstroth.

Langstroth gave us the pivotal discovery of the bee space, and he made a practical use of it with the movable frame. Still to enhance the utility of his invention, as we have seen, other modifications to his frame were needed. Most immediate was a self-spacing design and methods of making the bees build comb straight in the frame. Other improvements brought the frame closer to its final form. A set of small holes was drilled in the end bars for horizontal wires, which when embedded in the foundation made it stronger. Eventually a wedge was cut from the top bar and used to attach the foundation, giving it better support from above. With these improvements, we finally have the Langstroth frame as known today.

Acknowledgments

The author thanks Suzanne Sumner for her comments on the manuscript.

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From the "History of American Beekeeping"

When Langstroth invented the loose-hanging frame and the top-opening hive, he paved the way for a substantial industry in the production of honey, but two other important inventions were necessary before rapid progress was possible. Until the invention of the extractor and comb foundation, beekeeping was far from easy.

Johannes Mehring, in Germany, first made a press to imprint wax wafers with the bottoms of cells.

Prior to the invention of foundation, the beekeeper found great difficulty in obtaining straight combs and in controlling the building of drone cells. In his personal recollections which appeared in *Gleanings* in 1893, Langstroth mentioned the difficulty of inducing the bees to confine each comb to a separate frame. He recounted the experience of Della Rocca a hundred years previous in supporting small pieces of worker comb on the bars which he used with his hives. Huber made some improvement of the arrangement, but fell short of "Golding's simple plan of dipping the upper part of his guides in melted wax."

Because of the difficulties mentioned above, Langstroth spent much time in the development of a comb guide which would insure straight combs. The result was a triangular guide at the top of frames to take the place of the guide combs. This sharp edge below the top bar provided an attractive place for the bees to start the combs and proved of some help. Langstroth applied for a patent, feeling that it was essential to the success of his hives. Much delay ensued and similar applications from others finally resulted in the refusal of the commissioner to issue a patent to anyone.

Charles Dadant later told the story in the bee magazines of the effort which he made to secure worker comb during the early years of his experience, before foundation came into use. He sent his son about the country in early spring to buy the combs from all colonies which had died during the winter. Every piece was carefully saved and many small bits pieced together to the best advantage.

Later when Langstroth discovered that the triangular guide had been anticipated by John Hunter in 1793, and long before that by Della Rocca, he expressed great satisfaction because no patent had been issued to him. He had incurred many vexations, loss of time, and much expense, but he regarded these as trifling in comparison to the pain which comes to an honest inventor "when apparent success gives way to bitter mortification of finding the patent absolutely worthless." Hunter had written that, by the use of a salient angle, bees could be induced to build their combs in any direction desired and Della Rocca had described the triangular device for the same purpose.

Later a patent was issued to another claimant and Langstroth was sued for infringement. By this time, having the necessary information at hand, it was easy to defend the suit, but not without some annoyance and expense.

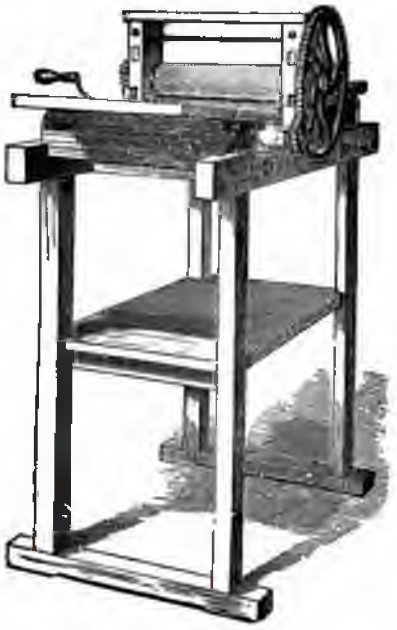
To get a hive filled with good, straight combs required close attention of the part of the beekeeper. It was a common practice to place an empty frame between two well-built combs. In this way, the bees would find it quite natural to build the new one in the desired manner.

The invention of foundation must be credited to a German, Johannes Mehring, who first succeeded in producing a crude product in 1857. He invented a press to impress wax wafers with the indentations common to the bottoms of the cells. There were no raised sides for cell walls, and the bees consequently were less inclined to build only worker comb. Much drone comb was built on such foundation, but it did provide a means of securing straight combs. A Swiss apiarist, Peter Jacob, improved the Mehring press, and some of his foundation was imported to America in 1865.

Samuel Wagner appears to have made some attempts to manufacture foundation, adding shallow sidewalls and, in 1861, secured a patent on the manufacture of artificial honeycomb foundation by whatever process made. He was not successful and later dropped the matter. In the meantime his patent probably kept others from experimenting and probably delayed the perfection of the process.

In 1876 *Gleanings* published directions

***Former editor of the *American Bee Journal*.**



Root developed his first foundation mill in 1876, and announced it as "a complete success."

by F. Cheshire for making a plaster of Paris mold on which foundation could be made. In the same issue, the editor comments at length of this and on the foundation made in this country by a man named Long and by F. Weiss, a German.

A. I. Root, with his characteristic enthusiasm, took up the improvement of the manufacture of foundation, which in its crude from had demonstrated its value to the beekeeper. He employed a man named A. Washburn to develop metal rollers with the proper impressions. Although Washburn actually did the work, he was working under Root's direction, at Root's expense, and it was Root who took the risk of failure: In the March 1876, issue of *Gleanings*, the announcement is made under date of February 26, "we are happy to state that the metal rollers are a complete success." The impressions were cut out by hand with metal punches.

This idea of the metal rollers solved at once the problem of making foundation. Apparently, other workers had thought only of making it on a flat surface in some kind of a press. In a letter from Wagner, published in *Gleanings* in 1876, he indicated that he was using a hexagonal type from which he made stereotype or electrotype plates on which the foundation was impressed.

Wagner found his cast foundation very fragile and experimented with paper as a base with the idea that, with a wax covering, it would serve the purpose more successfully. Never has the idea that a paper center foundation would be ideal been permitted to die. Even yet, at frequent intervals, the thing is revived by someone who thinks he has made a new discovery. Wagner reported in the *American Bee Journal*, in 1876, that light and beautiful foundation could be made of gutta percha, but that it soon became so friable that the material could not be used.

It is interesting to note that at the same time Root was developing his metal rollers, he apparently had some doubt as to whether he might be in danger of infringing Wagner's patent. In June, 1876, he published several letters from Wagner relating to the work which he had done. In a footnote, Root mentions the fact that Quinby had made comb foundation as early as 1864. It is strange, if this is so, that Quinby laid no claims to discovery, for this was much earlier than Mehring made his invention. In early issues of Quinby's book he advocates the use of pieces of guide comb to start the bees in the right direction. He suggests that one edge of the comb be melted, or that it be dipped in melted wax and applied to the wood before it cooled. It was probably this kind of foundation to which the reference applied.

There is some question as to just where to draw the line in giving credit to the men who were working toward the perfection of foundation at this early period. There appears to be no question as to Root's having solved the problem finally, but others seem to have been very near to it. A. J. Cook, in the early editions of his *Manual of the Apiary*, states that the King Brothers made and secured a patent on the first rollers. These, however, were mere wheels an inch and a half wide, stamped like the German plates. They were used to stamp the wax that was run on wood solely for guides. The machine proved of little value and never attracted much attention.

Cook credits Frederic Weiss with the invention, in 1873, of the machine which really brought foundation into common use. His rolls were about six inches long, with shallow grooves between the pyramidal projections so that a shallow wall was raised between the cells. Cook states that it was on this machine that the foundation was made by John Long in 1874 and '75 which proved that foundation was a success. As one who had used some of this early foundation, Cook should be a competent witness. He expresses regret at the tendency to ignore Weiss's services. In later editions he credits Root with having brought it into common use, but still credits Weiss with the invention. An earlier edition of the Dadant-Langstroth *Hive and the Honey Bee* credits Weiss with the first manufacuture of foundation in America, but states that it was probably on an imported machine.

With the problem of making the impressions solved, there still remained the necessity of getting the wax in proper form to run through the mill. For a time the best method known was to dip a board in melted wax and peel off the resulting sheet after it had cooled. This at best was tedious and unsatisfactory.

This led D. S. Given, of Hoopeston, Illinois, to attempt the manufacture of foundation by means of a press which would make

Given's foundation press, 1879, was composed of two metal sheets impressed.

the sheet in a wired frame ready for use. This press was described in the bee magazines in 1879 and for a time received considerable attention. Root stated in *Gleanings* that the Given press would make it possible to make up frames with foundation ready for use as needed.

Given's press was made of metal and produced a fairly good product, according to the comments published at the time. A year before, Oliver Foster made a plaster of Paris cast which appears to have been similar to that described by Cheshire and which he described with enthusiasm. In his published comments he stated that if made of metal, the plates would last indefinitely. Perhaps his suggestion may have provided the inspiration which started Given to work. The Given press was composed of two metal sheets impressed with the cell base form. These were joined together with a hinge which made it possible to bring them together with a sheet of wax between. The plates were then placed under a press

The Dunham mill gave thin base and high side walls, a definite improvement.

(l) In the first foundation factory of Dadant & Sons, flat boards were soaped and dipped in and out of hot beeswax until the wax sheets on the boards were the right thickness. Then the sheets were stripped off the boards, ready to be milled. (r) The wax sheets were run through hand-turned mills and piled together (lower right). Finally, the sheets were trimmed with knives to the right size. (The man at the left in both pictures is C. P. Dadant).

built similar to printing presses of that day which would exert heavy pressure. Thus, by shutting the plates together like a book over a sheet of wax and exerting sufficient pressure, it was possible to get a fair imprint. The product was not to be compared with that produced by roller mills and it was impossible to get more that a small sheet, so the Given press was later discarded.

Although Root was far in the lead with his rolls, the difficulty of sheeting the wax left him in position to make but little progress, and he continued to encourage every new method. In 1880 he paid one John Faris, of Virginia, $143 to come to Medina and demonstrate an outfit which he had made by using plaster of Paris. This was not different from others in important details, yet Root appears to have been impressed with it. He stated in *Gleanings* that he was not ready to make the plates for sale under the circumstances, although the foundation was better than any made by rolls. He thought that it would be improved and would not have been surprised if rolls had been laid aside entirely by another season.

Following the publication of the account of the visit of Faris to Medina, W. G. Phelps, of Maryland, claimed prior invention of the process described. When publishing his letter, Root commented that several others had made similar claims, which indicate that experimentation along similar lines was rather common just then.

In the meantime, others were giving attention to the improvement of the rolls. Mrs. F. Dunham is credited with having improved the machine so that the foundation would have a thin base and high, thick side walls. Charles Ohm improved the method of cutting the rolls and sold his rights to Root. Root thus remained in the lead, although a machine to make cells with flat bottoms was made by J. E. Van Deusen. Van Deusen sold foundation in moderate amounts for several years, but his product was not such as to stand the competition of that made from the improved mills which were by then available.

To Captain J. E. Hetherington, of Cherry Valley, New York, probably belongs the credit of originating the use of wire in supporting combs.* He also originated the foundation with flat bottom cells and obtained a patent for it. Van Deusen manufactured the flat bottom foundation, paying a royalty to Hetherington. Hetherington also obtained a patent covering the use of all kinds of wire supports for foundation, including wired frames. He seems to have made no attempt to profit from the use of wire, but freely gave the invention to the public. The use of wire for supporting foundation is nearly universal, although many different methods of application are in practice. J. Vandervort, of New York, built mills which proved to be more perfect than any at that time available, and, for a time, he enjoyed a considerable reputation on this account.

In July, 1883, Charles Dadant wrote of him in *Bulletin d'Apicultura*, "He is at the same time an excellent beekeeper, a mechanic outside the ordinary and a man outside the ordinary too." He was credited as being the one who had succeeded perfectly so far.

Vandervort sent several mills to Dadant and never sent him a bill for them. When fifty or a hundred dollars was forwarded, he would write, "I am overpaid." Dozens of mills were thus purchased from him at different times with no definite price attached.

The first year that the Dadants manufactured foundation, they sold 500 pounds during the entire season. The work was done under a tree in the open, by dipping a board in the tub of melted wax and then, when the sheet had cooled, running it through the hand mill. Six years later the amount had increased to 47,000 pounds in one year. At first, two men would work hard all day to get ten pounds of foundation of indifferent quality. Dadant saw the need of foundation with a thin base and heavier cell walls. When he went to see Vandervort and indicated his requirements, he was able to secure a mill to meet his needs.

About 1892, Dadants received a letter from E. B. Weed, of New York State, to the effect that he was developing a new process by making endless sheets of wax which would later be impressed with the cell forms. He required money in advance to enable him to visit Hamilton and demonstrate his process with the idea of selling it to them. The machine was described by C. P. Dadant as resembling a sausage filler, but as requiring refilling so often that little could be done with it, and as producing an irregular product. Dadants advanced further funds to enable him to return home and carry on some further experiments. Two or three years later he went to Medina, where he was able to complete his invention at the Root factory. When he made his contract with Root, he made the reservation giving Dadants the right to use it in consideration of their previous efforts on his behalf.

The new Weed machine forced the warm wax through a slot in the form of a ribbon, which was wound on a spool and would provide a sheet of any required length. This solved the one remaining difficulty in foundation manufacture and quickly eliminated dipping and pressing. Weed process foundation soon superseded all others.

*** D.S. Given claimed priority. *American Bee Journal*, p. 2. 1881.**

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The Classroom
by Jerry Hayes

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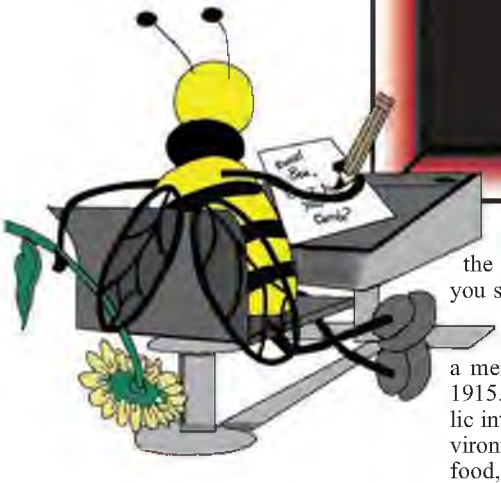


Q Boy Scouts and Beekeeping

Jerry back in 1964, when I was in the Boy Scouts, I was flipping through the merit badge book. I noticed that there was a merit badge offered for beekeeping. I was so excited that I immediately applied for the merit badge book through my troop master. From that day on, my life had changed forever. I have had bees in my life since. I have had as many as 500 hives. I have worked for commercial beekeepers in the USA and Germany. Now that I am in a position in my life to slow down, I decided that I would offer some of my time to the Boy Scouts and help get the young ones interested in receiving their beekeeping merit badge. I called the "Boy Scouts of America" to inquire about some troops in my local area. I was totally blown away when I was told that the beekeeping merit badge was no longer offered and hadn't been in a long time. I thought that the person was joking. It is no wonder there are fewer hobby and sideline beekeepers.

By the time our youth get to be in their upper teens, they have other interests like video games. I always believed that starting our youth with good things early in their life was the best answer for their success. Any ideas on how to put a little sting under the "Boy Scouts of America"? Our youth and our country would be better off if we could offer beekeeping through the Scouting program.

Dennis
Bryan, Texas

A The squeaky wheel gets the grease, Dennis. The louder the squeak (more people), the faster things happen. How can I help you squeak? This is not a new occurrence, as you probably know by now. The Boy Scouts eliminated Beekeeping as a merit badge in 1995. It was created in 1915. However, with the resurgence of public interest in preserving nature and the environment, as well as producing one's own food, perhaps it's time to bring back the Beekeeping merit badge. What do you think Boy Scouts?

RESPONSE FROM DENNIS

Maybe you could mention this problem in the magazine since that is a pretty big wheel that touches a lot of people, including scoutmasters. Ask for suggestions from the readers. Maybe you could find enough driving force to light the fire. After reading your column every month for as long as I have, I can tell that when you get a passion for something, you don't stop until you have accomplished your goal.

Think of all the young ones who are missing out on the wonderful world of beekeeping and the things it brings to the table! That special beekeeping knowledge lasts a lifetime and think of all the good it does for Nature. Because of your current position, you reach more people than any one of us. If you could get passionate about this fault in our society, take the reins, and generate the momentum, I and probably thousands of others would help in any way that presents itself. If we can't encourage our young people to participate in something that is good and wholesome, then what is left? Thanks for your help.

Dennis
Bryan, Texas

JERRY FOLLOWS UP

I took some time to track down the leadership of the Boy Scouts to ask your question "How can the Beekeeping Merit Badge be re-instated?" Man, that wasn't easy! Unfortunately, they are not a very transparent organization at the top—perhaps because they do not want hard questions? Because this exercise was so difficult I thought, "Let's go to the top and see what happens?" Chief Scout Executive / CEO Robert Mazzuca, Boy Scouts of America, 1325 West Walnut Hill Lane, P.O. Box 152079, Irving Texas 75015, email Robert.Mazzuca@scouting.org, 972-580-2000.

Comment: Classroom readers, you are a strong, smart and vocal group. Ask yourself if you want to do this. Can we make a difference? Let's see. Take a minute to contact Mr. Mazzuca in one or all of the ways above and see if he responds or ducks. Let me know.

Q Where Are Caucasian Honey Bees?

Hi Jerry! I am searching for suppliers of the Caucasian strain of bees or what might pass as "Caucasian" in North America, but so far I have come up dry. It seems as if breeders and suppliers have abandoned this strain. I know from reading your section in ABJ (The Classroom) that you have informational resources far beyond what I have. I was hoping that you have some information on breeders/folks who I might be able to contact. Thank you very much in advance for your help with my search!

Best regards,
Brien

A

Truthfully Brien, as much fun as it is to think about separate strains or races of honey bees in the US, there really isn't such a thing in its pure form. Because of few imports of any particular strains for decades and that virgin production queens are all open-mated, controlling the drone population is impossible. I would rather suggest that you look for queens that have certain identifiable hygienic traits.

However, in answer to your question, there still are a few queen breeders out there who advertise that they produce "Caucasians". A quick survey of a recent *American Bee Journal* shows Tony Homan Apiaries in Shannon, MS advertises Caucasians for sale. An Internet search would probably produce other Caucasian queen breeders as well.

Q Wasps and Cold Ohio

Hi Jerry, I have a two-part question. First: last fall I found a European hornet lurking around my hive. Is there any way to protect my hive from her expected offspring next summer? Second: It has been a long cold spell here in eastern Ohio, and the weatherman is not predicting a warm up any time soon. I am considering installing temporary heat into my hive just long enough to give them a chance to move the cluster to new stores inside the hive. I can do this without opening the hive or disturbing the bees. What do you think? I enjoy The Classroom very much.

Sincerely,
John Price
Flushing, Ohio

A

Hornets, wasps and yellow jackets need "meat" for protein to raise their young. They are trying to survive as a species and use whatever the easiest bee, moth, caterpillar, worm, spider is available to catch for their developing young's nutrition. There are a variety of "Vespa" traps (Google wasp traps on the Internet) that use bait such as a piece of hotdog as the food lure to keep populations in check. Beekeepers in some countries, where wasps or hornets are a big problem, even have traps that fit on their hives.

Healthy honey bees are adapted to long periods of confinement under cold temperatures. Colonies buried in snow are highly insulated and do very well. Artificial heat sources create confusion for the colony and may result in increased food consumption and premature brood expansion. Thanks for the Classroom compliment.

Q Honey Crystallization

Hi Jerry, my honey this year sugared about a month after it was extracted. I didn't do anything differently this year than last, other than a row of Sunflowers in the garden. What could cause a quicker sugaring? Thanks for your help,

Sybil Dupie
Conway, SC

A

Crystallization is a natural occurrence for a super saturated sugar solution (honey). Higher glucose sugar levels and cooler temperatures are the reasons for quicker crystallization of honey. Sugar ratios in nectar in the same species of plant can change slightly from year to year, based on amount of moisture, hours of sunlight, change in pH of the soil, etc. Then, add in different flowering plants, based on cyclical growth of annuals or a new crop of perennials. The whole mix of flora within a 2-mile radius of a colony of honey bees is always in flux.

Remember that this process is a natural occurrence and is a characteristic of natural honey that has not been heat-treated to stop this process. Most of the rest of world likes and uses finely crystallized honey "spreads" since they are more convenient and have an appeal that is oftentimes superior to liquid honey. Actually, this phenomenon is a plus and not a minus. Don't be disappointed; use it to your advantage. And, of course, if you do wish to return your honey to a liquid state, use the minimum of heat necessary to prevent darkening the honey or ruining its delicate bouquet.

Dadant creamed honey kit

Q Small Hive Beetle Control

Jerry, I have read the Classroom for years and trust your opinion. I live in Louisiana and have had problems with small hive beetles (SHB). They are always getting into my empty colonies and it is making me nervous. Also, I have had colonies *slimed* by them already. Many of my colonies just become empty at times. This is when the SHB moves in. A friend of mine said to use Co Ral to control them. He mixes it with oil on paper towels. I trust your judgment. Could you tell me if this is a good idea please?

Tommy
Monroe, LA

A

Tommy, thanks for being a steady reader of the Classroom for so long. SHB's are endemic to Louisiana, just as they are in Florida. They are everywhere living in the environment on fruits, nuts and berries. Trying to eliminate them as they enter failing or dead honey bee colonies is futile. The dead SHB will be replaced within hours or days. Seeing the dead SHB makes the beekeeper feel better rather than having any real long-term positive results. In regions of the South such as we are in, you can't catch SHB fast enough or in great enough quantities to make any difference.

SHB in the winter are in beehives simply to keep warm. Your colonies may be empty because of African Bee genetic influence, which results in colonies absconding when resources diminish. SHB developed in Africa along with African Bees that abscond and swarm 15-20 times a year. Therefore, in Africa SHB often reproduce in abandoned African Bee nests. But I digress.

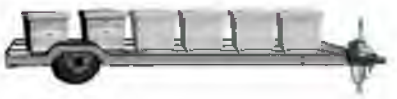
The product Co-Ral 6% uses the organophosphate Coumaphos as the active ingredient. This is the same active ingredient in the Varroa control product Check-Mite, but in a different concentration and different form and delivery system. Coumaphos is a deadly organo-phosphate poison that was abandoned as a safe agricultural insecticide. However, when varroa mites became such a scourge for beekeeping, it was taken off the shelf and reregistered to kill varroa mites and not readily kill honey bees. It is not a good product to be used around honey bees, beeswax, honey and the beekeeper.

We have found that it readily accumulates in beeswax. Beeswax is a chemical sponge. Adding Coumaphos to oil makes it very easy for the pesticide to soak into and be absorbed into beeswax and wood, etc., contaminating the beehive. Co-Ral is not labeled for use in honey-bee colonies be-

cause it is toxic to honey bees. Using it as described is not a smart idea nor is it legal.

A strong colony of honey bees is the best defense against SHB. If you want, you can use any of the SHB traps that are on the market for temporary control. Thanks for asking my opinion Tommy.

Q Bees on Wheels



I run my bees on trailers with no decks, open bottom. The hives sit about 16 inches off the ground. Every one says to use screened bottom boards and not seal the bottom during the winter. The weather here gets cold in the 30 plus range, but not for real long periods. However, we do have lots of high winds up in the 80 MPH. I would like your opinion: Is this going to kill the bees in the winter without solid bottoms.

Dennis Carlson
Enumclaw, WA

A

Dennis, I think having hives semi-permanently on trailers for ease of movement to pollination or nectar sources is a great idea. It certainly has been done before, but it never caught on in a large way. Cold temps do not kill healthy colonies of honey bees. I would be concerned about high winds though. Cold and wind chill are two different realities.

Q You Are What You Eat

I've found some of your articles on the web and thought you gave very good advice on the keeping of bees. I am new to this, but my aunt is a beekeeper and her thoughts are that bees should never be fed sugar water. She thinks it's cruel and that they should be able to partake of honey, as they need it. It is their natural food after all. I would agree, as she is the only beekeeper practicing this in her area and she is also the only keeper whose bees are multiplying so rapidly that she can barely keep up with housing them while everyone else around her is losing bees and also feeding them sugar water.

There have been studies recently that show that North American (not sure about the rest of the world) bees are actually showing signs of dementia and Alzheimer's and it is thought that this is partly as a result of feeding them sugar water for so long. Their DNA has been terribly broken down. Maybe this is all just speculation, but I think there could be something to it. Processed sugar is killing us, so why not the bees? Aside from that, I really do like your articles and will take them into consideration when I do begin keeping the wonderful little creatures.

Always best,
Chrysann

A

Chrysann, I am glad your aunt is having success with her bees. Whatever are the reasons for her success, nutrition is certainly one of them amongst all the variables. We as a species are certainly experimenting with our livestock, pets, the planet and ourselves. I certainly do not have all of the answers to the world's problems, but better nutrition, less exposure to toxins and respect for the stewardship we have been given as the dominant species at this time are among them.

Opinions vary among beekeepers regarding the feeding of sugar syrup, corn syrup, etc. Some beekeepers routinely feed artificial sugars to prevent bee starvation, while others do not like this practice. Both sides present good reasoning for their management practices. Also, remember that commercial beekeeping is much different than recreational or sideline beekeeping.

Q Treated Wood

Jerry, what about the use of treated wood for building hive components, particularly the bottom board and telescoping cover? There is a lot of concern today about chemicals getting into our food supply, and it appears that the chemicals used to preserve wood could get into the honey if treated wood is used in constructing the hive. Should we be concerned?

Roger Simmons
Baldwin County Beekeepers Association

A

There are trade offs in everything. "Treated" wood can contain a variety of chemicals/ compounds that inhibit rot and termite feasting, which is a good thing to make stuff built with wood last longer. But, *and there is always a but*, the chemicals/compounds used to slow the degradation of wood can and do have negative effects on other life forms other than molds, fungus, termites, ants, etc. There is data available that shows that wood treated with copper or zinc can raise the levels of these metals in a honey-bee colony. These metals can be picked up by honey bees walking on the surface of the treated woods and transferred to beeswax comb and into the bodies of the bees.

Then, think about the solvents used to keep these metals in suspension so that they can penetrate the wood structure of fibers. These solvents are probably more of a potential problem than the metals, themselves, as they are highly toxic when curing and off-gassing (drying) the material. Some woods are being treated with neo-nicotinoids such as imidacloprid, which is an insecticide that will kill termites. You probably have heard over the last few years about neo-nics and the implications they may have when used in production agriculture to kill bad bugs. Unfortunately, they also come into contact, in a variety of ways, with good bugs such as honey bees. Chemicals are great tools that provide a bounty of food for us, preserve our homes and keep us healthy.

The problem that is being seen is that so many of these chemicals are being used that there is overlap to other things and organisms like honey bees and more importantly, you and I.

Perhaps we need to look at the past and how our ancestors treated wood for preservation. Various oils like linseed and tung oil were used, as well as oil-based paints, keeping wood dry and using fewer pervasive insecticides to discourage termites and ants. It may not be as easy, but it may be safer for our bees and us in the long run.

Q Africanized Bees and Queen Mating

AHB

Hi Jerry, my name is Charles Roberson. I have a question that I have not seen covered in any of the books or magazines. I have asked several package bee and queen suppliers how they know their queens are not Africanized. They tell me they know because they saturate their breeding grounds with their drones. Well, what happens if one African drone breeds a queen, along with eight or nine of their drones? Will she lay Africanized eggs? Will her brood be aggressive? I hope you can give me an educated answer, which I can't seem to get from the breeders. Keep up the good work and thank you in advance.

Charles Roberson
Ben Wheeler, TX

A

You are pretty sharp, Charles. Good Job. With open mating, whatever drones are in

the area have a free shot at mating with a virgin queen flying through the Drone Congregation Area (DCA). In many parts of the Southwest, where AHB have become the dominant feral honey bee population, they will contribute drones to DCA's. Queens will mate with lots of drones, up to 40 in fact. The sperm is stored in an organ called a spermatheca in kind of convoluted layers.

Let's say, for argument's sake, that a queen mates with 20 drones, 15 European genetically based drones and 5 African genetically based drones. When egg-laying starts, the queen releases sperm, stored in these convoluted layers, to fertilize an egg. (African bee sperm can out compete and swim to the opening of the spermatheca to be used first, but let's not talk about that now.) Which sperm is used will determine the attitude of the workers produced because the drone carries the grumpy gene. Everything could be fine with a colony, as long as the queen is using the European layer of sperm. However, if the next layer is African sperm, in a few weeks the bees may start chasing you into the house or maybe even kill your neighbor's dog. One of the queen producers I've heard tells purchasers that if the bees get too feisty, they will replace the queen. That is because you can't control what happens in open mating.

Q EMERGENCY FEEDING

Hi Jerry, I hope you can give me some advice. We had a cold autumn, and the bees were not able to store enough feed for the winter. They are still alive, but running on empty. What can I do to save them? I've heard all of the following from beekeepers: "There's nothing you can do." "Feed them light sugar syrup with and entrance feeder." "Feed them sugar candy on the inner cover." Will any or all of these feeding suggestions work, or what are your suggestions? I have +/- 20 hives. I live near Montreal, QC. We should be seeing a few days above freezing shortly. Thank you.

Roger Loewen
Roxton Falls, QC

A

Ugh, Roger. Don't feel alone; this is happening a lot this year as a result of the cold, rainy summer that the upper tier of US States and Canada had. This is always a gamble, but try granulated sugar on the inner cover and hope the weather breaks often enough so the bees can go up through the hole and lick up enough energy to make it to the next break.

There are things called candy boards, which are big flat blocks of semi-hard sugar candy. These are put over a cluster and the moisture from cluster respiration helps the bees eat the wet candy.

This may sound goofy, but you can buy a bag of those large golf-ball size marshmallows and lay them on the top bars o the frames right above the cluster. Sinc they are mostly soft sugar, they can make a difference. Other than that, unless you saved frames of honey, this is about it. The recipe below is one of many I've seen to make winter sugar candy for your bees.

Sugar Candy for Winter Bee Feed

15 lbs. sugar
3 lbs. glucose or white syrup
4 cups water
1/2-teaspoon cream of tartar

Dissolve the sugar in the water by stirring and boiling the mixture until the temperature of the syrup rises to 242 degrees F. Let syrup cool to 180 degrees F., and then beat until thick. Pour the candy into molds lined with wax paper. Place a cake of sugar on two small, 1/2-inch square strips of wood in an empty super above the cluster of bees. Cover the candy and the space around it with cloth or newspaper to keep it warm. Remove any remaining candy and feed syrup when the weather gets warm. (From "The Hive and the Honey Bee" published by Dadant & Sons, Inc.)

What's Wrong With My Brood?

by DEWEY M. CARON
Emeritus Professor Apiculture Univ of Delaware
Affiliated faculty Oregon State University

An early warning sign of a bee colony in poor health, and especially a colony that may succumb to CCD, can be found in the brood chamber. Colonies often "tell" us about their condition – we need to develop the inspection skills to "listen" to the answer.

Beekeepers "read the frame" every time a colony is opened and brood area inspected. Frame reading takes experience and skill to determine if the colony is healthy, queenright, and is expanding (or contracting) their brood/adult populations as appropriate for the season. With experience, a colony "read" is done by inspecting 2 or 3 frames, but some colonies take longer and additional frames need to be removed to find our answers. We seek to improve reading skills every time we inspect a colony.

Experienced beekeepers know that it is a "waste" of time to routinely look for a queen, although, for many beekeepers , it is immensely satisfying and reassuring when we see her. When we requeen we will need to find her for removal and if we are dividing, we usually want to find her and leave her in the original colony so we can successfully requeen the new splits. But routine inspections supply us with the information "QUEENRIGHT" when we see normal egg laying – the eggs "tell" us a queen was in this colony within the last 3 days.

Our basic knowledge of brood development – 3 days of egg development, 6 days of larval feeding and 12 days in capped (pupal stage) cells – equips us to become hive detectives in our colony inspection of the brood area. We also need to recognize normal egg placement (1 egg per cell positioned more or less in center bottom of the cleaned cell) and what healthy brood looks like so we can diagnose when something is "not normal".

The larval stage is our key brood stage to diagnosing the early symptoms of CCD and decline of colonies. What are we seeing? Spotty brood patterns are often the first clue and then on closer examination we see unhealthy larvae, especially off color and twisted in the cell. Sometimes a general off-odor can be detected, even upon opening a colony in severe cases. The brood area looks wasted or cruddy and the larval remains look like snot – some are naming it snot brood or snotty brood (a more or less descriptive term for dying bee larvae) or sometimes cruddy brood (you can google both terms for descriptions). I prefer to use the term coined in early 2000s by USDA bee scientists for this condition – BEE PMS (Parasitic Mite Syndrome).

In colonies that have CCD, this poor brood appearance is duplicated in the adult population. Adult bees are "wasted" (lights on but nobody home syndrome), K-wing and crumpled-wing adults are often evident and crawling, disoriented bees seem common. Hence BEE PMS!

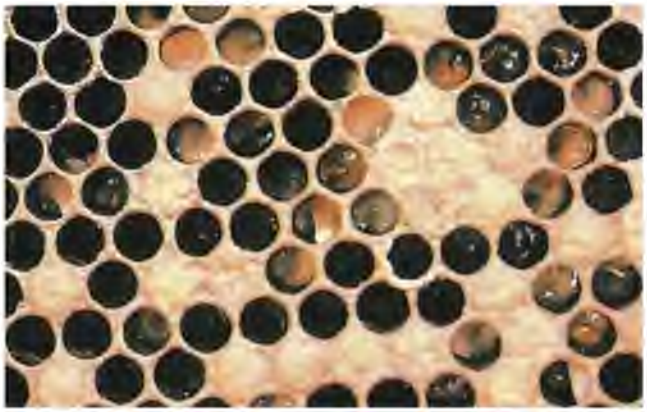
When samples are taken of unhealthy looking (dying) brood, the analysis usually comes back EFB. I strongly recommend that samples be taken and disease confirmation be obtained by sending larval samples to state labs (if available) or the USDA BEE Lab in Beltsville, MD, for analysis; most offer such service free of charge. If you want more details on EFB, besides the standard texts, I highly recommend you check out the new extension site (**http://www.extension.org**) and the EFB information authored by John Skinner.

EFB is mostly manifested in uncapped brood. In addition to seeing the "classic" EFB symptoms, other brood cells may have other diseases, such as sacbrood and sometimes chalkbrood, but there are other individual dead/dying brood cells that defy immediate field diagnosis. Some cells seem to have a combination of both EFB & AFB, especially when a ropy test is done. Such cells especially should be sampled for a disease confirmation.

Skillful beekeepers look to see a Ratio of 1 to 2 to 4 in the brood chamber (for every egg, 2 larvae can be seen and 4 times the number of capped cells will be present) and a covering mantle of adult bees. Such a "read' takes skill and practice. With CCD and heavy mite damage, this ratio and the coverage of adult workers is not properly balanced. Neglect of brood may be evident, especially at the margins of the brood sphere. Some cappings may be perforated (an AFB symptom), but inside a developing adult will be found rather than a broken down, foul-smelling prepupa.

Determining when a bee colony is increasing vs decreasing is not always an easy read. Also determining the amount of honey and pollen present as appropriate for the season is difficult to determine. Most commercial operations equalize colonies so all the units on a pallet are more or less the same in strength. If diseased brood is present, this management serves to spread the disease condition, not contain it. However this practice is likely to continue.

Read frames for queen presence, brood health and growth of colony.



(l) European foulbrood - discolored twisted larvae in several cells. (r) Colony Collapse disorder (CCD) often manifests its symptoms as spotty brood with sunken, perforated cells. Some beekeepers mistake it for American foulbrood which has similar symptoms.

With a diagnosis of a "probable" we should then look to "solutions." However, as we currently lack adequate answers as to the cause of CCD and/or poor brood appearance, our suggestions are only very general in scope. EFB can be treated with Terramycin ®, but the EFB condition will also improve once weather conditions (an external stressor) improve. Doing nothing often yields the same result as feeding the antibiotic. If the adult and brood symptoms are caused by a virus, nothing will immediately improve the disease situation. Standard treatment recommendations to feed sugar water and protein patties or to requeen later in the season (with the hope the new stock is less susceptible to the condition you are seeing) is always good advice. But be prepared to lose the colony too, especially in the early fall months.

If the colony is lost, we recommend airing out the frames (but still practice wax moth prevention) and culling the oldest, darkest frames seems wise. Feed-lot feeding, transfer of brood from stronger to weaker colonies and combining a weakening colony with another unit are also not advisable, but commercial beekeepers must continue to do so, especially when pollination colony payment is pegged to colony strength as in almonds, seed crops and blueberries.

Something is affecting overall colony health and we are seeing the decline in the brood area. Skillful inspection can help, but we lack adequate solutions to solve our current epidemic of losses. The brood is trying to "tell" us something, but are we prepared to "read" the brood to find "answers"?

Bee meetings are a good source of providing information on the latest answers. Bee Health will be a prominent feature of the upcoming WAS meeting in Salem OR Aug 29-Sept 2. Goggle western apiculture society to see the latest *WAS Journal* for program and registration information. Dewey Caron, long prominent in the EAS, will be president of the 2010 WAS meeting.

Early Spring Flowers in Northwest Arkansas: The Excellent, the Good, and the Poor

by Dr. Donald C. Steinkraus, Professor, University of Arkansas

The importance of pollen in the diet of honey bees cannot be overestimated. Pollen is the sole source of proteins, lipids, minerals, and vitamins for the growth and development of bees in all their stages. Indeed, in a very real sense, bees are made entirely of pollen.

It is also crucial that honey bees have varied sources of high quality pollens. At no time of the year is this more critical than during very early spring, because the cold winter confinement has been stressful to the bees. The British bee pollen expert, Dorothy Hodges (1952) stated:

"*In the very early spring, when a fresh intake of pollen is vitally necessary, and when at the same time the bees are limited by temperature to short distance flights, every flower within reach of the hive becomes important, and in particular the flowering trees such as elm (Ulmus), poplar (Populus), and ash (Fraxinus). A few of these trees near the foraging hive provide a vast foraging area.*"

I believe that Dorothy Hodges was 100% correct that our bees benefit greatly from pollen and nectar sources close to the hives during the late winter/early spring. Unless a beekeeper has a very large acreage, it is probably not possible to significantly affect our honey harvest by planting nectar-rich flowering plants. However, during the crucial months of late winter/early spring, the period when the bees are rearing the first generations of brood that will become the nectar harvesters later in the spring and summer, we can affect the outcome by planting pollen and nectar producing species.

In Northwest Arkansas, where I keep my bees, we are fortunate because we usually have relatively mild winters. Almost every week there is a day with temperatures in the 50-60˚F range when the bees can leave the hive, cleanse themselves, and forage for pollen and nectar. During January-March each year for the past decade, I have walked in a radius of two miles from my hives in Fayetteville, Arkansas, making observations of what plants are flowering and if honey bees are foraging on them. I found honey bees were gathering pollen and nectar on warm days during this late winter/early spring period. I roughly estimated the value of the plants to bees by the numbers of bees I observed foraging on flowers of each species: many bees, few bees, or no bees. I identified the plants and determined whether they were native or exotic. Large trees, such as elms, maples, poplars, or willows were not included in my study. Based on my observations, I make recommendations for plantings homeowners could make to improve bee forage during the crucial late winter/early spring period when the bees are rearing their first brood after their winter hiatus. My recommendations, while specifically for Northwest Arkansas, are applicable to many other areas of the country.

For a moment I would like to digress and discuss a book I highly recommend for all beekeepers, indeed, for all humans. This book was written by my friend and colleague, Dr. Doug Tallamy, chair of the Entomology Department at the University of Delaware. It is called: "*Bringing Nature Home*". Dr. Tallamy studied the plants in the American landscape to determine their value to our natural ecosystems, as food for birds, insects, and other wildlife. A major finding Doug made was that usually, "native" plants are much more beneficial for our native insects and birds than "exotic" plants. If we can all agree that we want a diverse, sustainable nature, then his book is of great value. One thing we have to keep in mind is the fact that the honey bee, *Apis mellifera,* is itself an exotic species, not native to North America.

First let's discuss the common flowers in Northwest Arkansas that were most valuable for bees during late winter/early spring.

Excellent Sources of Pollen and Nectar

Mahonia

Mahonia aquifolium (Oregon grape or

Fig. 1. Mahonia flowers. Mahonia blooms even in January. On warm days honey bees forage on them bringing essential pollen and nectar back to the hive when little else is in bloom.

Fig. 2. Mahonia berries are attractive and valuable food for birds. Humans can eat them too. Photographed May 6, 2009.

holly grape) (Berberidaceae). Mahonia flowers are long lasting, an excellent source of pollen and nectar, and the bees love them (Fig. 1). I have seen Mahonia blooming early in January, even when there is snow and ice on the plants. It has leathery, prickly evergreen leaves. Its small grape-like fruits (Fig. 2) (though not related to grapes), are edible, may be used to make jelly or wine, and birds eat them readily. Mahonia is native to Western North America, but not Arkansas. Pellett (1976) states that in the northwestern United States, Mahonia is a minor source of honey. It is a reliable, hardy, small shrub in Arkansas. I highly recommend beekeepers plant Mahonia for their honey bees. I love this plant!

Cornelian Cherry

Fig. 3. Cornelian cherry trees are lovely in very early spring, don't get too large, and are great for bees.

Fig. 4. Honey bee on cornelian cherry.

Cornus mas (Cornaceae). The Cornelian cherry flowers in late winter and early spring. It is a lovely small tree (Fig. 3) profusely covered with small golden flowers (Fig. 4). The bees love it! This is an exotic plant, originally native to Central and Southeastern Europe. In spite of it not being native to North America, I highly recommend this tree for early spring forage for honey bees. Hooper and Taylor (1988) agree that if you plant one dogwood for bees, plant the Cornelian cherry.

Dandelion

Taraxacum officinale (Asteraceae). The humble, lowly, dandelion, is despised by millions of homeowners who attempt to herbicide it out of existence. This is an exotic plant, originally from Europe and Asia, but it is a heck of a great plant for bees and other insects. I often find, even in winter, a few open dandelion flowers in protected parts of

Fig. 5. Honey bee on dandelion. I consider a field or yard full of dandelions to be a beautiful sight.

lawns. On warm days the bees find these isolated flowers and gather pollen and nectar (Fig. 5). Yes, the dandelion is despised, but it is actually a lovely plant, and I far prefer to see lawns filled with dandelions than pure stands of grasses (most of which are also exotic). My advice: stop using herbicides on your lawns and let the dandelions bloom!

Crocus

Fig. 6. Honey bee gathering pollen and nectar on crocus. A sure sign of spring is bees gathering from open crocus blossoms.

Crocus spp. (Iridaceae). These are among my favorite late-winter flowers for bees. Many bloom very early, even when snow is still on the ground! They provide high quality pollen and nectar on warm late winter days (Fig. 6). They are very easy to grow, reproduce readily, and will repay you with beauty when few other flowers are in bloom. Your bees will thank you by gathering pollen to rear their first crucial brood in preparation for the major honey flow later in the spring. Crocuses are native to southern Europe and Asia.

Pussy Willows

Salix spp. (Salicaceae). There is nothing I like to see more than plump furry pussy willow flowers covered with pollen and bees (Figs. 7 & 8). A number of small willow species are called "pussy willows" because of their large catkins. These attractive plants provide valuable nectar and pollen very early the spring. One species, *Salix discolor,* is native to North America and two are exotic: *S. caprea* and *S. cinerea*. Pellett (1920) states that there are about 160 species of willows in North America. Some of them bloom early, provide copious pollen, and occasionally provide a honeyflow. These are important shrubs and trees for bees. Pussy willows are well worth planting to benefit your bees. They also make great bouquets!

Fig. 7. Pussy willow blossoms in full bloom on March 28, 2005. What a beautiful sight! The plump golden anthers are full of pollen to feed honey bees.

Fig. 8. Here you can see a bee, its corbiculae full of pussy willow pollen, heading back home to her hive on March 28, 2005.

Lenten Rose

Fig. 9. Hellebores or Lenten roses are almost carefree, bloom very early, and bees love them. Photographed on March 28, 2005.

Helleborus orientalis (Ranunculaceae). Hellebores are beautiful and valuable perennials that flower in late winter and early spring. They are very attractive to honey bees and provide excellent pollen and nectar (Fig. 9). They are hardy and easy to grow. They are native to Europe and Asia. I highly recommend hellebores for the home beekeeper.

Grape Hyacinth

Muscari spp. (Hyacinthaceae). There are about 40 species of these small, blue, early spring flowers. They are hardy and multiply quickly. Grape hyacinths are exotic, originating in lands near the Mediterranean Sea. Grape hyacinths are very attractive to honey

Fig. 10. Honey bee collecting pollen from grape hyacinths.

bees even though the individual flowers are quite small (Fig. 10). Because grape hyacinths are attractive, easy to grow, multiply readily, and provide bees with pollen and nectar, I recommend them for the home beekeeper.

Good Sources of Pollen and Nectar

Vinca

Fig. 11. Honey bee gathering nectar from Vinca on March 28, 2009. Bees gather nectar from these flowers very quickly; spending just a second or two per flower. They put their tongue into the flower, give a suck, and then are off to the next blossom.

Vinca spp. (periwinkle) (Apocynaceae). Vincas are often planted as ground covers because of their attractive evergreen leaves and pretty blue flowers. There are five species originally from Europe, northwest Africa, and Asia. Vincas can be invasive which is a good reason not to plant them. While I did observe honey bees gathering nectar from Vinca flowers, they were not numerous (Fig. 11).

Dead Nettle

Lamium purpureum (Labiatae). In spite of its name, this is a mint, not a nettle. Large areas of lawns are often covered with this small plant in March in Arkansas. I have occasionally observed a few bees collecting pollen and nectar from this species. The bees must stick their heads deep into the flower to get nectar (Fig. 12). In the process their heads become brilliant red from the pollen of this plant (Fig. 13). However, I did not find that bees were enthusiastic about dead nettle. I could only find a few bees working it. A related species, henbit (*Lamium amplexicaule*) (Labiatae) is also abundant in March lawns. I rarely saw bees foraging on henbit.

Fig. 12. Dead nettle photographed on March 30, 2005. There were large areas of dead nettle blooming, but few bees were visiting it. It did not appear to be a highly desired pollen and nectar source. I observed great flower fidelity by the bees. The few bees gathering from dead nettle were not also gathering from dandelions and chickweed nearby.

Fig. 13. Note the dusting of rich red pollen on the head of a honey bee foraging in dead nettle flowers.

Tradescantia

Fig. 14. Tradescantia, a native plant, is visited by bees.

Tradescantia spp. (spiderworts) (Commelinaceae). There are about 70 species of spiderworts. They are native to the New World. Some people consider them to be weeds, but they are also cultivated. While bees were observed foraging on the blue flowers in early spring (Fig. 14), spiderworts did not appear to be highly desirable to bees in my observations. However, Pellett (1976) states that spiderworts attract "large numbers of bees . . in early morning for pollen." He says that by mid-morning the pollen is exhausted and the bees pay no more attention to this plant until the following morning.

Japanese Quince

Chaenomeles japonica (Rosaceae). These are attractive small shrubs with attractive

Fig. 15. Japanese quince are very lovely early-blooming plants. However, in my observations they were not very attractive to honey bees.

red, pink, or white flowers (Fig. 15) that are native to Asia. They flower early and are a pleasant sight in March. Hooper and Taylor (1988), Hodges (1952) and Pellett (1976) all list quince as a good flower for bees. However, I rarely observed bees on quince.

Chickweed

Fig. 16. Mouse-ear chickweed photographed on Mar. 30, 2005. Like dead nettle, chickweed did not appear to be a preferred flower for honey bees. Again, the bees had amazing flower fidelity. The individual photographed only foraged on chickweed even though dead nettles were abundant surrounding the chickweed. The bees seemed to be gathering only nectar and each visit was short, only 1-5 seconds. The photograph shows that even these tiny (to humans) flowers are large to a bee. The world the bee lives in is so interesting, full of color, scents, sweet nectar and pollen. Imagine that we were the size of a bee and lived surrounded by giant flowers!

Stellaria and *Cereastium* spp. (Caryophyllaceae). These are tiny flowering plants that are often found in lawns and disturbed areas. I believe the photograph is of mouse-ear chickweed, *Cerastium vulgatum* (Fig. 16). Few bees were foraging on chickweed, but those that were showed amazing flower fidelity. They appeared to be gathering only nectar. The bees were very efficient; spending only 1-5 seconds on each flower.

Witch Hazel

Hamamelis sp. (Hamamelidaceae). The witch hazels are extremely early blooming shrubs. The flowers are produced during the winter on bare, leafless branches. The flowers can be yellow or red and have distinctive

Fig. 17. Witch hazel flowers photographed on February 26, 2009.

crinkly strap-like petals (Fig. 17). In Northwest Arkansas they begin blooming in January, providing pollen during the first brood rearing cycle.

Poor Sources of Pollen and Nectar

Bradford Pear

Fig. 18. Bradford pears photographed on March 25, 2005. Bradford pears are pretty when in bloom, but bees don't like 'em and neither do I! These were photographed in a Fayetteville park and were recently removed. Good riddance!

Pyrus calleryana (Callery pear) (Rosaceae). The Bradford pear is top on my list of worthless plants. It is a small to medium tree widely planted in Arkansas and nationally. This exotic tree is native to China. It is superficially attractive, covered with white flowers in the spring (Fig. 18). The flowers have a foul smell and I have not seen bees visiting them. Bradford pears are resistant to diseases, but the wood is weak and the trees often split and fall apart during storms. Some varieties are invasive. I dislike Bradford Pears and highly discourage their planting. Instead plant native flowering cherries, crabapples, or other plants that provide food for bees and birds. I jokingly call them "Bad Forage Pears."

Daffodils

Narcissus spp. (Amaryllidaceae) Daffodils are lovely flowers and we have many in our yard (Fig. 19). They thrive in Arkansas. There are many species, perhaps 100 and are native to Europe, North Africa, and Asia. They contain an alkaloid toxin, called lycorine. Possibly because of this toxin bees do not gather from daffodils. There may be varieties or species of daffodils that have pollen bees like and can utilize, but I am not aware of them. A few

Fig. 19. Daffodils are wonderful harbingers of spring and I love them, but unfortunately honey bees do not.

years ago a botanical garden in Arkansas bought thousands of daffodil bulbs to benefit the bees. I had the sad task of informing them that daffodils are of no use to bees. Lycorine is used as an immunosuppressor in some human illnesses. It inhibits protein synthesis and has led to poisoning in people who have ingested daffodil bulbs. While I do not believe daffodils will help your bees, they are beautiful plants and will help fill your spirits with joy in the spring.

Forsythia

Forsythia spp. (Oleaceae). These common shrubs produce their bright yellow flowers very early in the spring. Unfortunately, they do not seem to benefit honey bees. *Forsythia* flowers are interesting in that they produce lactose, the same sugar that is in cow's milk. I doubt that honey bees can digest lactose. I suspect that this is why I have never seen bees gathering from flowers of these shrubs. Even many humans are lactose intolerant. *Forsythia* species are exotic with about 11 species from eastern Asia. I recommend planting native plant species of pussy willows or Mahonia in place of *Forsythia*.

Star Violet Bluets

Houstonia spp. (Rubiaceae). Bluets are very small, delicate flowers that are abundant in late winter/early spring in lawns in Arkansas (Fig. 20). I love their beautiful flowers, but I have never seen bees collecting from them. Perhaps they are just too small to make it worthwhile for a bee to visit them. There are about 20 species of bluets in North America and they are native.

Fig. 20. Bluets photographed on March 30, 2005. These small flowers were exceedingly abundant, but I never saw a honey bee visit them. Perhaps they are just too small, or lack pollen or nectar. It is probably not worth a bee's time to try to gather from these tiny flowers.

Speedwell

Fig. 21. Speedwell is another tiny pretty flower that blooms in March, but, like bluets, speedwells may be too small to be worth a bee's trouble to forage.

Veronica spp. (Plantaginaceae). Another tiny pretty flower that is abundant in March. I have never seen bees foraging on these flowers (Fig. 21). Like bluets, they may be too tiny to make it worthwhile. There are about 500 species of Veronicas. Some are native, some exotic. Pellett (1976) states that speedwell flowers are "very attractive to bees" and can be a minor source of nectar. This has not been my observation.

Summary

Getting back to Doug Tallamy's book, I am amazed at how many exotic plants are in our landscape! Few of the plants I observed honey bees foraging on during late winter/early spring in Fayetteville were native plants. Mahonias, Tradescantias, and pussy willows were the only native plants I observed bees visiting during this early spring period. Maples, elms, poplars, willows, and other early flowering trees are undoubtedly important forage plants for honey bees, but they were not the subject of my observational study.

Finally, obtain a copy of "Bringing Nature Home", read it, and make your yard or property friendly for all wildlife, including honey bees.

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Biographical Sketch

Dr. Steinkraus is a longtime beekeeper, teaches apiculture and morphology of insects at the University of Arkansas, and is an insect pathologist.

The Primer Pheromones and Managing The Labor Pool

Part 1

by Randy Oliver
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I've spent my adult life trying to understand the minds of women and bees; I find female bees to be far more predictable. In many aspects of bee behavior, there are relatively straightforward stimulus/response effects. In this article I hope to summarize the current state of knowledge on how the colony allocates its work force, and what initiates the various forms of colony reproduction. The better we understand what drives colony behaviors, the better beekeepers we can be! With that point in mind, I've started inserting "Practical Applications" into my articles, to show how the understanding of bee biology is the basis for practical management decisions—some standard maxims, some perhaps more innovative or alternative.

The Thinking Colony

We humans tend to anthropomorphize animal behavior, which is often just plain silly. The most caring, gentle, nurturing beekeeper can pamper a hive to no end, yet will still have her friendship rewarded with a volley of stings to the face should she move a bit too quickly. Bees simply do not "think" like humans, and the romantic notion that a ***colony*** "deliberates, feels, or plans" is merely metaphorical.

Lest I sound callous, a bee ***colony*** sure acts as though it "thinks," but one must realize that any actual action is performed by ***individual*** bees responding to simple stimuli—any "thought" would only apply to the behavior of a single bee. The amazing thing is that the overall result is a democratic and wondrous organization of colony function.

Let me give you an example. Every beekeeper is familiar with how a frame from the center of the broodnest looks—an oval of brood, with an arc of pollen above it, *then* open nectar or honey, *then* capped honey at the top and sides (Fig. 1). Consistent, predictable, and clearly designed for efficiency. But think about it—it's pitch black inside the hive, and no single bee has much of an idea what is going on, even as close as an inch away. So how the heck do they create such a consistent pattern without a plan or foreman?

A groundbreaking study by Dr. Scott Camazine (1990, 2001) details how such apparently coordinated efforts can be produced simply by each individual bee following simple "context-dependent behaviors." The term that is used for such a process is "self organization of biological systems."

Dr. Brian Johnson (2009a) recently created a model for the formation of the typical broodframe pattern that expands upon Camazine's work. Johnson's model incorporates four context-dependent behaviors, with bees moving randomly until they find what they are seeking. Greatly simplified, the behaviors are:

1. The queen lays an egg if she finds an empty cell that is ***within four cells of another brood cell***. She starts near the center of the frame, and quickens her movement if she finds herself walking over cells of nectar.
2. Pollen foragers ***seek cells near open brood*** in which to store pollen, otherwise they deposit it randomly in an empty cell.
3. Nectar receivers walk ***upward*** until they find an empty or partially full cell in which to unload.
4. Nurses search randomly for food, ***starting in the brood nest*** (note that the model

Figure 1. A frame of brood generally has a consistent pattern—an arc of pollen above the brood, open nectar above that, and capped honey at the top and sides. Note how, in response to smoke, some bees have run to gorge on open nectar.

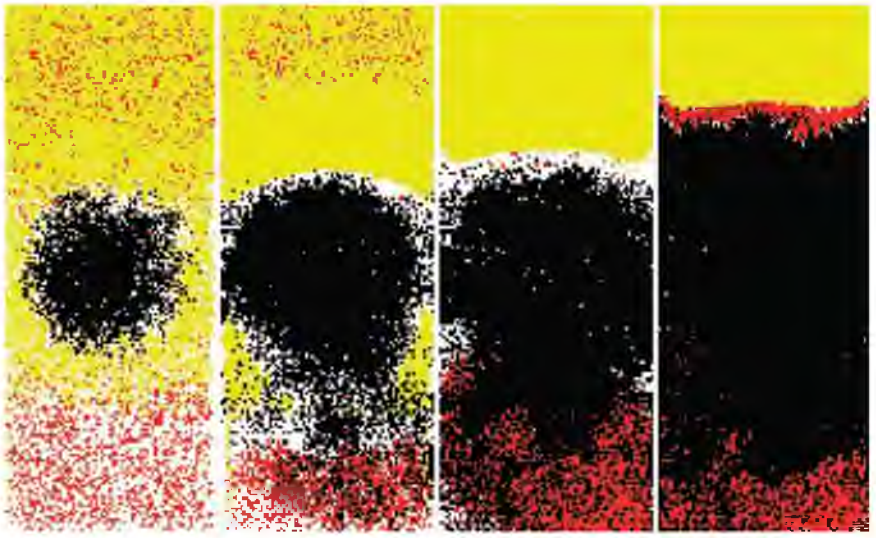

Figure 2. A simulation of the formation of the typical brood nest pattern during a honeyflow, with rain on days 9-11. White = empty cells, yellow = honey, red = pollen, and black = brood. Note how in this simple "self-organizing" model, pollen is stored initially mainly below the brood, but is then consumed during the rainy period, and by Day 14 is beginning to form the typical band above the brood. My appreciation to Dr. Brian Johnson for running these plots for this article. For details, see Johnson (2009a).

does not incorporate a sense of smell).

Figure 2 is a series of plots from a computer simulation produced by Johnson's model. Note how closely it approximates the "real thing." His paper is freely downloadable, and worth the read, as are two other recent papers (Johnson 2009b, 2010).

Practical application (beginners): Note how the behavior of nectar receivers is to walk upward until they find drawn comb in which to unload. However, they do not "expect" there to be empty comb above the honey band at the top of the brood frames. Therefore, if you place a super of *foundation* above a queen excluder, the bees may ignore it, yet fill every cell of the brood chamber *below the excluder* with nectar before they will work up *through* the excluder. It helps to either pull the excluder temporarily, or to "bait" the super with a drawn comb (or better yet, frames of brood), or to reverse the brood chambers to make sure that there is not a band of honey directly below the excluder.

Practical application (comb honey producers): Similarly to the tip above, crowding the broodnest into a single, so that the brood displaces the honey band, will encourage the bees to fill comb honey supers directly above the excluder.

Practical application (pollinators): Dr. Frank Eischen (in prep) found that "the crescent-shaped space above the broodnest that is used for pollen storage is a critical factor in driving pollen collection" in almond orchards. Colonies that plug out have little reason to collect pollen.

What scientists often do when they want to understand some aspect of bee behavior is to take a reductionist approach, and try to determine the "proximate cause" (the trigger that leads directly to an outcome) for that behavior. The point of models, such as Johnson's above, is to test our understanding of the "cause and effect," "stimulus/response," or "activator/inhibitor" processes in a system, by seeing if the model replicates what we observe in nature.

In this article, I am going to take a similar approach, and look at the mechanisms involved in the management of the major functions necessary for colony success: broodrearing, foraging, supersedure, swarming, and wintering. Surprisingly, it appears that the proximate causes and regulation of all these behaviors are largely controlled by pollen income, the in-hive transfer of jelly, and three primer pheromones!

Colony Communication & Pheromones

Definitions: Any substance, produced by an organism, that provokes a response in another organism is generically called a **semiochemical**; if the response is in an individual of the same species, it is called a **pheromone**; if it benefits another species (such as a parasite) it is called a **kairomone** (I mention this one because you will be hearing much more about kairomones when we get to varroa behavior).

The communication of information is the fabric of bee society, largely taking place within the dark confines of the hive. It is important to realize that the vast majority of every bee's life is spent in complete, or near complete darkness. Since sight is useless under such conditions, bees must communicate by vibration and sound (waggle and tremble dances, buzz run, piping, etc.), touch (stop signal, shaking signal), smell, and taste. I'm going to leave the discussion of their senses of vibration and touch for another time, and focus on taste and smell.

TABLE 1

Compound	Young larva (11 ng/larva*)	Old larva (560 ng/larva*)
ethyl linoleate	3	1
ethyl linolenate	7	13
ethyl oleate	33	8
ethyl palmitate	12	3
ethyl stearate	15	7
methyl linoleate	10	2
methyl linolenate	0	21
methyl oleate	11	25
methyl palmitate	9	3
methyl stearate	0	17

*total esters in 1 larval equivalent (Leq)

Table 1. Components of the brood pheromone from two different-aged larvae. Note how greatly the proportions of some components differ. All the compounds are esters—formed by combining an alcohol (in these cases ethyl or methyl alcohols) and an organic acid. These particular esters are all formed from long-chain fatty acids typically found in vegetable oils (linoleic, oleic, and palmitic acids)—thus they are not very volatile. From United States Patent US6595828.

The economic news of the hive is largely communicated by the sharing of food, and especially by the bees' exquisite sense of smell. Any beekeeper is familiar with the rich aromas of the hive—beeswax, propolis, floral scents of the nectar and pollen, and of the bees themselves. However, we are virtually "deaf and blind" to the major "language" of the colony—the pheromones. Of the numerous (over 50) pheromonal components produced by bees, we humans generally only perceive two at best—the "banana-rose" odor of alarm pheromone, and the "lemon geranium" smell of the orientation pheromone.

Even a cursory review of the honeybee's chemical communication repertoire reveals a rich vocabulary. Work by Drs. Yves LeConte and Tanya Pankiw have demonstrated how the major pheromones are composed of several different components (generally aromatic esters) which can vary in proportion, depending upon what the bee "wants to say." Think of the individual components as words that can be used to phrase sentences, complete with nuance and emphasis. For example, the proportion of each component of brood pheromone differs between that of male or female larvae; young or older larvae; hungry larvae, satiated larvae; or those ready to be capped over (Table 1).

Pheromones differ greatly in their degree of volatility—some, such as alarm pheromone, evaporate quickly, waft through the air, and then dissipate. Others are more "oily" and need to be physically

transferred from bee to bee. In general, the more volatile act as ***"releaser" pheromones that elicit short-term behavioral responses*** (such as homing toward orientation pheromone). The less volatile function as ***"primer" pheromones, which cause longer-term physiological changes***, such as ovary suppression in workers, change in brain function, or vitellogenin production in nurse bees. In some cases (such as with brood or alarm pheromones) a single pheromone can elicit both behavioral and physiological effects (Alaux 2007, LeConte 2001).

To an individual bee (which has a sense of smell that's better than a bloodhound's), the sum of all the aromas of the hive create a unique and ever changing olfactory assessment of the colony milieu. A bee doesn't need to read the paper to get the news and an economic report—that information is continually shared in the gossip of ritualistic trophallaxis.

Trophallaxis

It's easy for us to understand how volatile pheromones can waft through the hive carried in the circulating air, but the means of transport of the nonvolatiles is truly amazing. We've all seen bees sharing food on the comb via the face-to-face ritual of trophallaxis. In one classic study (Nixon & Ribbands 1952), researchers found that a colony given a few teaspoons of radioactively labeled syrup spread it evenly among 98% of the sampled nestmates within 48 hours. The efficient circulation of ***pheromones*** in the bee superorganism via trophallaxis is akin to the circulation of ***hormones*** in the blood of the human circulatory system.

Practical application: when one gives medications to a colony, they are generally quickly spread to all members. The amount of syrup, sugar dust, or other vehicle is generally not as critical as that of *getting the right dose* of active ingredient into the hive in one form or another.

Most everyone assumes that trophallaxis is all about the exchange of food. Surprisingly, researchers have found that in the vast majority of trophallactic interactions, ***no food is exchanged whatsoever***! Most of the time, the bees are only passing pheromones, largely via the tapping of their antennae. The hundreds of thousands of trophallactic interactions in a hive each day function as a vast and intricate interactive communication network (Fig. 3).

Practical application: each time you smoke a colony, the communication network is disrupted, since smoke affects the bee sense of smell (Visscher 1995). There is little research as to the effects of various medications, essential oils, or pesticides on colony communication.

Let's return to the workings of the bee economy. Johnson's model for the arrangement of brood and pollen was relatively simple. Pheromonal communication is far more complex. In an excellent review of the subject, Slessor, Winston, and LeConte (2005) state:

Figure 3. Bees engaged in trophallaxis. Note the touching of antennae, which serves to transfer pheromones from bee to bee. The group at the bottom appear to be sharing food; the pair at the upper left are sharing only information. Photo courtesy Dr. Zachary Huang.

"Recent studies have demonstrated a remarkable and unexpected complexity in social insect pheromone communication, particularly for honeybees…. The intricate interactions characteristic of social insects demand a complex language, based on specialized chemical signals that provide a syntax that is deeper in complexity and richer in nuance than previously imagined."

The complexity and nuance mentioned clearly apply to two of the multicomponent primer pheromones—brood pheromone and queen pheromone. Please realize that we've only scratched the surface in our understanding of this pheromonal communication interplay. Allow me to quote from Sarah Kocher's (2009) doctoral dissertation:

"The results of these studies demonstrate that the chemical communication system between honey bee queens and workers acts a dialog, rather than a simple, static signal-response system, and that variation in pheromone production and response both play a critical role in modulating queen-worker interactions within the hive."

Please humor me as I give you an analogy. Let's say that you ask a woman, "How are you feeling?" A simple sentence, composed of simple words. But imagine the differences in meaning, depending upon which word you accent. If you accentuate the first word, you sound like a doctor. Stress the second, and you are a friend asking for an update. The third, you are comparing her feelings to yours. Emphasize the last to express concern for her emotions (believe me, I've learned to watch inflection carefully!).

Even with the variation of meaning demonstrated above, that's only the half of it! You must put any of those inflections into ***context***. Is she having a bad day? Did you have an argument yesterday? Is she exhausted, excited, ill, angry, lonely, emotional, hormonal, or feeling loving ***at the moment***? (Or any of the gazillion other unfathomable "primers" that affect how a woman takes anything that a man says.)

This is apparently how it is with bee pheromonal communication. Any exchange of information via pheromones can exhibit inflection, and is highly context dependent—the message can be tweaked by either the sender or the recipient. Although we use the term "brood pheromone" generically, a hungry young larva makes a very different statement than does an older larva ready to pupate; and the responses to the same pheromonal composition will be quite different from a nurse bee or a forager (foragers ignore larvae).

Perhaps because of that complexity, it appears that we can explain much of the communication involved in organization of the bee economy based solely upon three primer pheromones of paramount importance: brood pheromone, queen pheromone, and ethyl oleate produced by foragers.

I'm out of space now; next month I'll diagram just how the system works…

Acknowledgements

I could not begin to compile the information necessary for my writing without the steady assistance and suggestions by my friend and collaborator Peter Loring Borst, to whom I am again indebted. I would also be greatly remiss not to tip my hat to that great bee researcher, Dr. Tom Seeley, for his immense influence in the field of bee behavior (both Scott Camazine and Brian Johnson were PhD students of his!).

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Suggested Review Papers

I recommend the following for those who wish to delve deeper.

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The Traveling Beekeeper

Biology of Cell Production & Cell Starting

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In spite of some beekeeper's best hopes, queen bees have finite lives, although they are the longest lived of any individual in the superorganism we call the bee colony. As a result of their evolutionary history, honey bees have developed several strategies for queen replacement. Before we discuss queen cell production methods, we will review the conditions under which queen cells are produced in nature.

When a queen fails, the bees notice. There is considerable beekeeper and bee scientist debate about the reasons for failure and the mechanisms the bees use to detect it. The most widely accepted theory is linked to a reduction in pheromone production by the queen—when a vigorous queen starts to produce fewer chemicals that are part of queen pheromone, or queen substance. The bees stimulate the queen to start new queen cells. The most common reason for failure is due to the queen's increasing age and reduced egg laying. If a queen has been producing as many as 1,300-1,500 eggs per day and suddenly produces only 600, we would agree with the bees that it is time for the old queen to be replaced by *supersedure*. If a bee colony had an infinite life (even superorganisms eventually die), they would still need to systematically replace the old queen with a new queen in order to maintain colony population.

The second queen production strategy occurs when a colony grows strong enough to reproduce itself. Bee colonies, as superorganisms, reproduce the social unit by *swarming*, when part of the colony leaves with one queen and part stays behind with another.

Queen cells four days after grafting, with excellent coverage by the nurse bees. Note the cells are near the point of being sealed.

At times it is difficult to sort out supersedure queens from swarm queens because both are triggered by a reduction in the *concentration of queen pheromone per bee*. The colonies with a vigorous queen and many bees—conditions we associate with swarming—predictably have brood areas filled with eggs, larvae and pupae. Queen cell cups are often on the edge of the brood area, and for that reason the swarm cells are located on the edge or fringe of the brood nest. We find queen cups at the bottom and sides of the brood combs, and also where there has been a break in the comb (and between hive bodies) or constructed on a piece of burr comb.

If we follow the theory that reduced queen pheromone is responsible for new cell initiation, then the supersedure process is explained in the very same way, only now the colony is often weaker and has a reduced brood area. The queen lays eggs into those queen cups located within the brood nest resulting in supersedure on the face of the comb. There may be empty queens cups outside the brood area that are not used.

The third queen cell production mechanism results when a queen is accidentally killed or removed, and the bees use the *emergency* response to build cells. Over time colonies have been subjected to extensive predation by mammals, birds, other insects and humans. During these attacks the queen may be killed. When the queen is killed or

Student queen producer at a class in Texas. The bees are only covering the cells that first were accepted.

removed, the queen pheromone drops dramatically, so the cell production response is strong and immediate. Some estimate that colonies know that their queen is missing in as little as 15 minutes. Without the queen the worker bees select a large number of worker larvae and convert their worker cells into a queen cells. They feed the larvae with royal jelly throughout development. The chemical nature of royal jelly changes as the new queen larva matures and is fed by worker bees. This diet provides the biochemical triggers for development as a queen rather than a worker.

The emergency response gives each colony a survival strategy to keep itself alive by producing cells from suitably aged larvae remaining in the comb. In this behavior, many cells may be started, but relatively few are completed.

Cell Starting

When large numbers of young nurse bees are confined in a queenless state with abundant food and water, they will start a large number of queen cells and initially feed them very well. Because they are confined, they cannot sustain this intensity of feeding, so after the second day the number of viable cells drops. In this emergency environment, starter colonies are an excellent way to start a large number of cells, but not to finish them.

There are many ways to make cells in a beekeeping operation. For small quantities, beekeepers can remove the queen from a quality colony, and let the bees raise emergency cells in her absence. A modification of this method is to move open brood and bees above a screen or board with a new, rear entrance placed on the hive to let the queenless bees produce natural queen cells. Charles Mraz of Vermont used this method throughout his lifetime and felt it maintained genetic diversity. If a queen is a good brood producer and the colony is strong and healthy, move her with a frame or two of brood and worker bees to a new hive and let her establish a new colony. The queenless hive can then produce a new queen.

A Simple Starter Colony

To start queen cells we use the emergency response by removing the bees from the queen. In our system, we rely on the colony's biological urge to produce queens from the right-aged larvae we give the hive after the queen is removed. We introduce these suitable larvae to produce a new queen.

My most successful method of starting queen cells has been with a *closed cell starter* containing the following:

1. The young nurse bees shaken from one colony,
2. A frame of pollen and one of honey,
3. One or two drawn frames for cluster space, and
4. A sponge or towel soaked with water.

The easiest container for this starter box is a five-frame nucleus box with a screen on the bottom, and perhaps on the sides. It should be bee-tight and filled with nurse bees.

The Setup Process

This system was developed by Steve Taber and promoted by Marla Spivak and Gary Reuter in Minnesota. I have used it for over 25 years as a simple method to teach beekeepers how to raise queens. Are there other methods that work? Yes there are, and I have used many of them. However, this method is the most reliable I have found to

Worker bee feeding the larva in the queen cell cup. Note the abundant royal jelly filling the cup, a key to good queen rearing.

Good coverage from cells grafted by students at a Michigan queen rearing class. Note the smile!

What age larvae should you graft? The youngest possible. But newly hatched larvae have little royal jelly. A well-fed colony will have abundant royal jelly around the larva at 12 hrs or so.

Good cell coverage. These bees are doing a variety of duties: measuring and regulating temperature, secreting wax, forming the cell, secreting royal jelly and feeding the larva inside. Once sealed, they will keep the cell the proper temperature for good cell development, and monitor pheromone production by the maturing queen pupa.

teach others to produce cells.

The starter box is a four- or five-frame nucleus hive with window screen or hardware cloth fastened to the bottom and/or sides. This is placed on the rim of a bottom board, or two small boards, to provide ventilation. If the weather is below 45 degrees F. place it in a barn, garage or outside room to keep the bees from going into cluster. If the weather is hot, find a cool place to store the starter so the bees are not stressed.

Starter boxes can be made from a hive body you already own. I have used half of a double nuc box to establish a starter. One starter uses a cardboard nucleus box with window screen cut and taped to the sides. An eight- or ten-frame hive body (deep or medium) will work if a follower board (dummy frame), is used to confine the bees into a small area to maintain crowding and the temperature needed for cell production.

After the Graft

We will discuss the transfer (grafting) process later, but the starter colony is most often set up in the afternoon or evening, and the cell cups are placed into the starter colony following an hour or more of queenless confinement. One worker larva is moved—transferred or grafted—into each cell cup. The larvae were removed from a frame of worker brood produced by a breeder queen. The number of cells given to each starter colony will vary, according to the time of the year and the number of nurse bees. As you use this method, you will learn to estimate the ideal number of cells each starter can receive.

Because starters do a terrible job of finishing queen cells, move the started cells into a *cell finisher* the day *after* you graft. The starter is only used for 18 to 24 hours. If it has done its job, a large percentage of the cells you placed inside will have an expanded pool of royal jelly with the larvae floating on that jelly. In addition, the bees will have added beeswax to the edge of the grafting cell (either plastic or beeswax), creating a small cone of delicate beeswax.

If you use plastic cell cups, you will be able to look through them and see that there is a layer of royal jelly at the bottom of the accepted cells. Cells may be combined before being placed into the cell finisher.

Adapted from Dr. Connor's newest book *Queen Rearing Essentials*, which may be ordered at www.wicwas.com or at your bee supply dealer. He will be teaching three-day queen rearing programs in several locations this summer, including Connecticut and Michigan. Email him for details at LJConnor@aol.com or check the website.

birds, bees, and Springthings

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Proteins, Honey Bee Nutrition and Amino-B Booster™

by JAMES W. AMRINE, JR.[1] and ROBERT C. NOEL[2]

Abstract: We discuss proteins, amino acids, honey bee nutrition, pollen digestion by honey bees, and introduce a new product, Amino-B Booster™. The new product is a Proprietary Apiary Blend of selected amino acids that provides all necessary nutrition for assimilation of protein. Amino-B Booster™ is added to sucrose sugar syrup with Honey-B-Healthy® (HBH) and fed to bees at times when pollen is not available or pollen protein is deficient. Free amino acids are rapidly absorbed in the midgut and delivered to growing tissues. Several benefits to honey bees and to beekeepers are listed.

Key words – Amino-B Booster™, amino acids, proteins, pollen, honey bee nutrition, Honey-B-Healthy®.

Honey bees need protein in their diet for production of cuticle, muscle, glands, cell walls, enzymes, etc. The bees obtain protein by digesting pollen grains in the midgut. Different pollen types have different amounts of protein (Bell et al. 1983; De Groot 1953; Honeybee Australis 2010; Oliver 2010; Somerville 2005; Stace 1996; Wikipedia 2010).

Pollens relatively rich in protein are those plants that are insect or bee-pollinated: dandelions, apples and other fruit trees, clovers, alfalfa, false indigo, and many other plants. Even some of these may be deficient in one or more essential amino acids.

Pollens poor in protein are most grasses, sedges, conifers, ragweeds, and other plants that have wind as a pollenizing agent. These will not support growth of honey bees.

In all cases, the needed protein is digested in the honey bee midgut. When eating pollen, the bees must secrete enzymes into the midgut lumen; these must then penetrate the tough pollen grains where the various proteins (if present) are digested into smaller fragments called peptides and polypeptides until finally, the protein is digested to free amino acids. These small molecules are then able to be absorbed by the midgut cells where they quickly enter the hemolymph, or are transferred to various hemocytes [blood cells] which circulate throughout the body, carrying the needed amino acids to growing tissues, glands, muscles, etc. The tough pollen grains often limit the amount of the pollen that can be digested (Bell et al. 1983) to a fraction of that which may be present. Bees need a wide variety of pollens in order to insure adequate nutrition (Somerville 2005).

The following 21 amino acids (AA) are found in most animals and honey bees. Essential AA [must be in the diet]: isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine. Nonessential AA (* = essential in some situations): alanine, asparaginine, aspartic acid, cysteine*, glutamic acid, glutamine*, glycine*, proline*, selenocysteine*, serine*, tyrosine, arginine and histidine. The nonessential AA can be produced in the bees by secondary metabolism from the eight essential AA (Wikipedia.org 2010). In many pollens in Australia, isoleucine is a limiting amino acid; de Groot found that the threshold of good development of bees requires a minimum of 4mg isoleucine per 16 mg protein (De Groot 1953, Somerville 2005, Stace 1996). In our opinion, the availability of free amino acids in the diet circumvents this limitation.

Feeding "Amino-B Booster™" to Honey Bees.

We began experimenting with a proprietary free amino acid blend, "Amino-B Booster™", in late January 2009. The blend

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Figure 1. Three half quarts of feeding mixes were placed on the top of a colony late December, 2008. Within a short time many bees were clustered on the HBH/Amino-B Booster™ jar on the right with only a few bees on the Amino-B Booster™ mix in the center and HBH mix on the left.

Figure 2. Brood raised in early February, 2009, in Cumberland MD, from the feeding of Amino-B Booster™ in sucrose sugar syrup (1:1) with Honey-B-Healthy®. The amino jelly is stored in a band around the brood. Inset shows a close-up of the amino jelly which stays liquid and is not capped.

Figure 3. Brood produced in late October and November 2009 as a result of feeding of Amino-B Booster™ in sucrose sugar syrup (1:1) in Cumberland, MD; date of photograph is 29 Nov 2009. Lower right inset shows bees covering the brood frame taken from the hive. The center frame shows brood after bees are shaken off. Upper left inset is a close-up of the brood and bees.

Figure 4. On a warm day in Feb. 2009 (Cumberland, MD) the bees were observed carrying pollen (inset) and a cell with a bit of pollen was found. The amino jelly was stored in cells where pollen is typically stored, in a band around the brood.

contains 20 amino acids including all of the essential amino acids and most of the non-essential amino acids.

Ingesting free amino acids with Honey-B-Healthy® in sucrose sugar syrup provides a distinct set of advantages to the honey bees.

1. The bees do not need to secrete enzymes into the midgut to digest protein.

2. Pollen grains with their tough exines do not need to be penetrated to obtain the protein.

3. The free amino acids are absorbed immediately by the midgut cells.

4. The ratio of amino acids is not critical; the bees immediately acquire and absorb the amino acids they need. Proteins in pollen must have specific AA in minimum levels to allow adequate digestion of the protein and assimilation of the needed AA (Stace 1996). Free AA in the diet circumvents this restriction.

Bees flocked to the Amino-B Booster™ & HBH sugar syrup feeders (Figure 1) in greater numbers than to any other syrup we have tested. The syrup is rapidly converted by the bees into 'amino jelly' and stored with the HBH which acts as a preservative plus providing the benefits of HBH. The amino jelly is placed in cells in the pollen-cell zone of brood frames (Figure 2). The amino jelly is then available in the brood nest for feeding larvae, newly emerged bees and other adults as needed.

Protein is cycled in worker bees as follows: first, to the food glands in the head: the mandibular and hypopharyngeal glands (young nurse bees, ages 1 d to ~12 days, need the protein to produce the rich secretions for bee milk and royal jelly). Then, to the 8 wax glands in the abdominal sternites, which increase in size and sequester protein to make the many enzymes in order to rapidly secrete high quality wax. The protein is then broken down to free amino acids and moved to the flight muscles for the foraging bees. All of these transfers of protein require considerable secondary metabolism to convert some of the old proteins to amino acids for transport. This overall plan can be reversed, depending on the needs of the colony.

By providing free amino acids in Amino-B Booster™, all of these processes can be improved and accelerated: food glands can theoretically grow larger and secrete richer proteins and vitellogenin. Wax glands can grow more quickly as amino acids are provided direct from the diet and need not be rapidly sequestered from the food glands. Flight muscles can grow more rapidly in bees > 18 days old for the same reason.

Our experiments show that feeding Amino-B Booster™ in early spring, during dearth and in the fall leads to immediate brood production in the hive. This can be a good thing if you are moving bees into early pollination contracts or preparing for honey production from plants that have an early bloom, such as the Autumn Olive (*Elaeagnus umbellata* Thunb., Elaeagnaceae) in WV.

Brood production at the wrong time can stress hives during severe winters or stress hives that are in weakened condition without sufficient honey stores. Increased brood production requires a great increase in honey consumption in order to maintain the 94° F (34° C) degree brood temperature. For this reason, we recommend that Amino-B Booster™ not be used after September in most cases, unless you are preparing bees for movement into almonds and/or other early crops in February or March, and your bees have sufficient honey to support the higher brood temperatures.

Rapid increase of brood production will encourage swarm production by many colonies; beekeepers need to be ready to control swarming or be ready to produce nucs and make divisions to keep up with the rapid increase in bee populations.

Autumn bees go into winter with up to 67% stored protein and vitellogenin in the fat body, and draw on this body-protein during winter stress and to raise late winter brood if needed when there is poor, low or no pollen stores in the hive. They can consume body-protein to create royal jelly and bee milk to feed their brood. "The level of body protein in adult bees ranges from 21% to 67% in direct relationship to the quantity and composition of available pollen protein and work load imposed by reproduction and honey collection" (Kleinschmidt and Kondos 1977).

In late January of 2009, all pollen was removed from four colonies (Figure 2) and they were fed HBH/ Amino-B Booster™ syrup and we were amazed to see healthy brood raised from this one test before learning about stored body protein and Amino-B Booster™ being a source of protein; not a complete diet. More research needs to be done to see if Amino-B Booster™ will be a viable product for beekeepers, especially commercial beekeepers preparing for almond pollination who can possibly double their colony sizes on syrup feedings alone. And for queen breeders who need an early amino acid jump-start in order to produce healthy, hardy queens. The bees store the amino jelly as they do pollen (see Figure 2 top left).

On Oct. 10, 2009 all of our colonies were void of brood except for the four that were fed Amino-B Booster™; we removed the feeding jars on this date. On Oct. 28 we began to feed one colony not previously fed Amino-B Booster™. On Nov. 09 we found brood; and much more brood on Nov. 29 (Figure 3) and continually through Decem-

ber, 2009, and January, 2010. The bees had a few frames of brood all winter in this Amino-B Booster™ fed colony. This was only a test and is not recommended to do prior to long winter clustering.

Figure 4. On a warm day in Feb. 2009 the bees were observed carrying pollen (inset) and a cell with a bit of pollen was found. After four days of the bees not flying, Feb. 16, the small bit of pollen was gone: consumed by the bees. This observation proves that the bees, even though feeding on HBH/Amino-B Booster™ syrups, will still gather pollen; their natural protein supply. Therefore, the HBH/Amino-B Booster™ feeding does not appear to interfere with the bees normal nectar or pollen gathering.

Amino-B Booster™ is being released in 2010 on a limited basis [test market by Dadant & Sons].

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Nosema ceranae—The Inside Story

by TOM WEBSTER
Kentucky State University, Frankfort, KY

Quite a bit has been written on *Nosema ceranae* in recent years. This pathogen was discovered in European-stock honey bees only a few years ago. Now we know it to be a worldwide disease. Much of our understanding of *N. ceranae* is based on a century of research on a related disease, *Nosema apis*. *N. apis* is the "nosema disease" discussed in many honey bee books. It often weakened colonies without killing them. But this newly discovered *N. ceranae* is more serious, and the biology is different in significant ways. Collectively, they are called "Nosema" in this article.

This article will cover some of the fundamental issues and focus on what I feel are the most important findings. We can organize our understanding and long-range plans into the areas of biology, diagnosis and control. Biology comes first, because it is essential to good diagnosis and effective control. Careful diagnosis is essential to beekeeping, and a little tricky because the symptoms of Nosema can be ambiguous. Treatments beyond fumagillin, sold by the trade name Fumagilin, have been hard to come by. This microbe is well protected either by the spore wall, or by the honey bee tissue it invades.

Biology

Much of our understanding of both Nosema species is illuminated by a vast amount of work on the larger group called the Microsporidia. This is a group of parasitic fungi, and it includes over 200 different species of Nosema. These pathogens have much in common, and some even infect humans. Later this year, Dr. Lee Solter will contribute an article describing the big picture of these pathogens and their hosts, and how they inform us of honey bee pathology.

Like other Microsporidia, the Nosema organism exists as a spore form and a vegetative form. The spore is a single cell with a tough coat around it. Like spores of American foulbrood or chalkbrood, it can survive for years on beekeeping equipment. We must direct our control efforts at both forms. But the strategy for spore destruction is very different from the efforts to kill the vegetative form. An infected bee usually has both spores and vegetative forms.

The infection begins when a bee, usually a worker, consumes spores. This can happen when a house-cleaning bee removes feces from comb, and ingests some spores from the feces. The spores then travel through the esophagus, the crop, and then into the midgut. The midgut is where the bee produces enzymes to digest pollen and honey, and absorbs the nutrients in those foods. Some sort of stimulus then causes the spores to germinate. This means the spores each shoot out a very long, thin tube called the polar filament. See Fig 1. This filament is so long and moves so quickly, that it often reaches one of the cells that line the inside of the bee's midgut.

After the filament penetrates the bee's

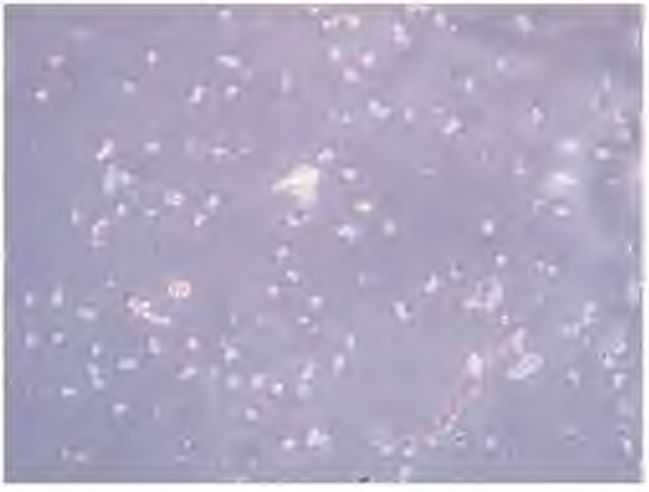

Fig. 1. The white oval at upper left is a *Nosema ceranae* spore that has germinated. Follow the very long polar filament down to the lower right. It was too long to catch in one photo. (Filament has been darkened for easier viewing by the reader.) (r) Fig. 2. A hive with fecal "spotting" above the entrance suggests Nosema, either *N. apis* or *N. ceranae*.

Fig 3. The field test is an examination of a bee gut pulled from a bee. The midgut is just out of each bee, and the rectum is farthest to the left. Note that the midgut of the upper bee is slightly lighter in color. The crop, or honey stomach, and esophagus are inside of the bees.

midgut cell, the remaining contents of the spore migrate through the filament. This is the infective machinery of the Nosema organism, the "sporoplasm". When the sporoplasm enters the bee's cell, trouble begins. The Nosema hijacks the bee's cell processes, and begins to grow and multiply. This is the vegetative form of the disease. Soon the bee's cell is entirely dominated by the developing Nosema, and new spores form. Some spores invade adjacent bee midgut cells. Others are shed when the midgut cell breaks open. These new spores may germinate in the midgut and infect more cells. Or they may pass on to the rectum of the bee, and come out in feces.

Several new twists on the story have come to light with recent research. *N. ceranae* DNA has been found in the hypopharyngeal glands of infected worker bees, and in stored pollen in infected hives. The hypopharyngeal glands secrete much of the food for bee larvae and the queen. Perhaps this is another mode of disease transmission.

Diagnosis

It is quite common for beekeepers to treat their bees for Nosema without knowing whether they have the disease. This can be an unnecessary expense, and possibly harmful to the bees. However, diagnosis is not always easy. The following are methods for diagnosis, each with its advantages and problems.

Spotting on the front of the hive. Bees with problems in their digestive system will often defecate on the front of the hive, as they exit and crawl up from the entrance. See Fig 2. This "spotting" can be caused by Nosema infection, and apparently by other disorders. So this symptom suggests Nosema, but is not a sure indicator of disease. On occasion I have collected this fecal material from the front of a hive and found no spores when I examined it by microscope.

The "field test". One popular test is to pull the midgut from a bee and examine it for discoloration. Often, a healthy midgut will appear reddish brown, while a bee with Nosema will have a white or cream-colored midgut that is swollen. A beekeeper can examine a bee in the field, by pulling the gut out with tweezers (Fig. 3). A magnifying glass is helpful.

But this field test is also unreliable See the midguts in Fig. 4. The midguts numbered 1 – 10 were taken from healthy bees I collected at the hive entrance on a nice day. Those numbered 11 – 20 were heavily infected, after consuming spores in laboratory cages. The two sets of midguts look about the same. So appearance cannot be a good indicator. I suspect that a white or creamy, smooth midgut can be caused by other microbes, perhaps as secondary infections that may or may not occur with Nosema. Also, pollen in the midgut adds to the color and varies widely according to the floral source of the pollen.

Examination of gut contents with a microscope. For a rapid and accurate diagnosis, a good microscope is the tool of choice. A sample is prepared by squashing the guts of bees in water, and placing a drop of the liquid onto a microscope slide. A magnification of 400 power is best. The spores are seen as ovals, about 3 microns by 5 microns. *N. apis* spores tend to look like "racetrack" ovals: flat on the sides and round at the ends. *N. ceranae* spores are more almond shaped, and slightly smaller. However, there is wide variance in shape among the spores, so we cannot rely entirely on what we see. Spore shape suggests the species of Nosema, but is not conclusive evidence. The vegetative form of the disease is there too, but difficult to see with a standard microscope.

A hemacytometer is a special type of microscope slide that allows one to count the number of spores in a small volume of water, and estimate the total number of spores per bee. A heavily infested bee may have over 20 million spores of either type of Nosema.

The antibody test. This test was described by Dr. Kate Aronstein in the January 2010 issue of this journal. It has very important promise because it will be rapid, simple, and will not require the expense of a microscope.

Genetic methods. Tests for DNA specific to a species of Nosema is the gold standard. A lab method called polymerase chain reaction allows the identification of minute amounts of DNA from either *N. apis* or *N. ceranae*. However, this test is laborious and requires expensive equipment and considerable expertise.

Other possibilities. I have seen extensive fecal debris on the inside of a *N. ceranae*-infected hive. Feces were on the top bars and underside of the inner cover. My observations were in July, when the bees could fly nearly every day. This hive appeared healthy in other ways. This raises the possibility that spore transmission via fecal debris can happen in good weather, not just when the bees are confined indoors during a long winter.

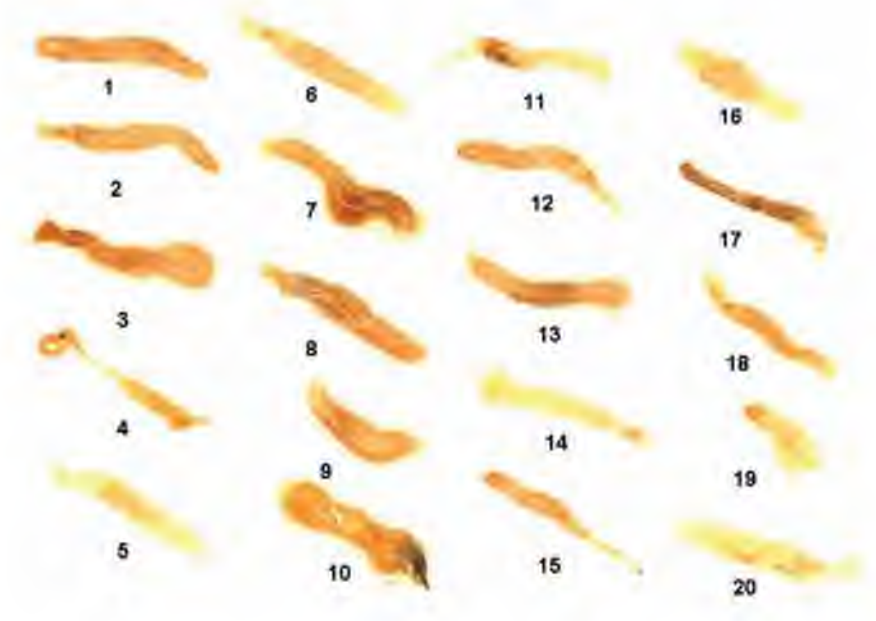

Fig. 4. Does the field test always work? Ten of these 20 midguts are heavily infected with Nosema, and 10 are from healthy bees. See the text for an explanation.

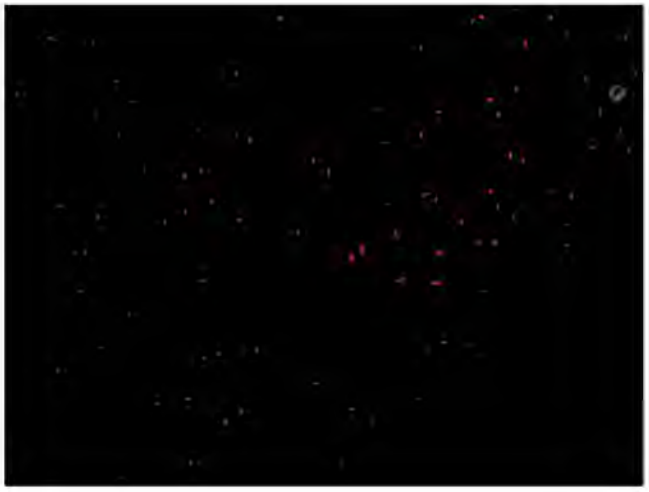

Fig. 5. The spores that glow red under UV light are not viable. The spore membranes have been ruptured by a sterilizing agent, and a red fluorescent stain has penetrated these spores.

Controlling Nosema disease

Control of vegetative forms inside the bees.

Fumagillin. This chemical has been used for many years to control Nosema in honey bees and related pathogens in other animals and in humans. It is often still effective against both *Nosema apis* and *Nosema ceranae*. However, we must consider alternatives. We cannot rely on a single type of treatment. Experienced beekeepers have seen the development of varroa mites highly resistant to chemical controls and American foulbrood bacteria resistant to antibiotics. The same problem will certainly arise with extensive use of fumagillin.

Fumagillin is produced naturally by another type of fungus called Aspergillus. Like many microbes, Aspergillus has developed its own arsenal of chemicals that help it survive.

Fumagillin treatment is prepared in sugar syrup, and fed to bees. Inside the midgut, it penetrates Nosema-infected cells. There it interferes with the Nosema genetic machinery, or with certain proteins. It does not affect the spores. After fumagillin treatment, the midgut will still contain viable spores unless the infection is in its earliest stage, before spores have formed.

Beekeepers should be aware that Nosema spores will persist inside the bees long after the fumagillin treatment. Even if all of the vegetative forms are killed by fumagillin, spores will persist, possibly for weeks. Some beekeepers who collected bees from their hives a day or two after treatment have been alarmed to see that the spore counts did not go down. From this, they incorrectly assumed that the treatments were ineffective. Beekeepers should wait for at least several weeks after the bees consume the fumagillin before sampling again for Nosema.

Beekeepers should also be aware that fumagillin will degrade quickly in light, especially sunlight. It should not be fed to bees in clear, glass jars that are exposed to sunlight. Also, it is heat sensitive. Fumagillin should be added to syrup after it has cooled.

Many other products have activity against the vegetative form of Nosema. Unfortunately, most are either less effective than fumagillin or more expensive. The difficulty is that a product must enter the honey bee midgut cells to kill the Nosema. And it must not seriously affect the very sophisticated and complex honey bee colony behavior and physiology.

However, I am somewhat optimistic that effective and relatively inexpensive treatments will be discovered. We can consider that plants and animals have been battling fungal diseases for over a billion years. That has given them plenty of time to develop their own natural defenses. One such product is now under study here at KSU.

Control of spores outside of the bees, by comb and equipment decontamination.

Now that *N. ceranae* is known to be widespread in the U.S. and other countries, many beekeepers must consider methods for decontamination of equipment. If a bee colony dies or is weakened by the disease, we must assume that much of it is contaminated with spores. Healthy bees on this equipment will quickly consume spores by their comb-cleaning behavior, causing the disease cycle to resume. Destruction of the equipment would be effective, but expensive.

Several agents do kill spores. One is ultraviolet (UV) light. In Fig 5 we see spores killed by UV light. The killed spores are bright red with a fluorescent stain, which enters spores with damaged membranes. Years ago, in a more civilized time, people dried their laundry outdoors on something called a clothes line. This often sterilized the clothing as it dried, because sunlight is a potent source of UV light. UV light kills Nosema spores quite effectively and it leaves no chemical residue. The main problem is that beekeeping equipment must be manipulated quite a bit to allow light, from the sun or a UV lamp, to get exposure into all the cells and wooden parts. This may be an option for some small-scale beekeepers.

A variety of liquids, including dilute bleach and alcohols, also kill spores. However, these methods also require considerable equipment manipulation. The equipment must be dried and free of fumes before it can be used by the bees.

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Simple Small Hive Beetle Diagnosis

by MARC O. SCHÄFER [a,*], JEFF S. PETTIS [b], WOLFGANG RITTER [c] and PETER NEUMANN [a,d]

One part of my PhD-thesis (2005-2008) was diagnosis of small hive beetles (SHB) in the field. Conventional methods were quite labor intensive. Therefore, I felt the need for a much simpler method suitable also for beekeepers with many hives. During my thesis research I was fortunate to have several fieldwork-trips to the Beltsville USDA-ARS Bee Research Laboratory in Maryland. I enjoyed these times very much. The whole bee-team was always very kind and helpful and after the first, short adjustment period treated me like a part of the team. In the summer of 2006 I had the idea for a method to diagnose SHB infestation levels in the field, which we further developed together with Jeff Pettis, the research leader of the Beltsville Bee Laboratory.

Here, we would like to present our simple and fast method for quantitative diagnosis of SHB in honey bee field colonies using two different types of corrugated plastic strips. The efficacy of the newly invented diagnostic strip ("d-strip") was evaluated in Richmond at the University of Western Sydney, Australia in 2006. The material for the strips was purchased as large sheets from the local hardware supplier and then cut into strips. These transparent corrugated plastic strips (75´500´4 mm) were introduced on the bottom boards of 54 colonies via the flight entrance and remained there for two nights (Fig. 1). An efficacy of 35.4 ± 20.6% was calculated by comparing the number of lured SHB with the total number of beetles in the hives [2]. Using the same method, we compared our d-strips with commercially available ones, that are made of black corrugated plastic, which have slightly different measurement (100´478´4 mm) and are equipped with a cut out handle (**http://www.thorne.co.uk/**; Fig. 2). The strip-thickness of 4 mm for both types of d-strips, was chosen to create narrow tunnels, which serve as a hiding place for SHB, but prevent bee access. As the tunnels of the black strips were slightly narrower compared to the transparent ones (Fig. 3), we were wondering if this would have an impact on the strip-efficacy. Therefore, we compared efficacy of both d-strips at an apiary.

The apiary was located near Wye Island, Queenstown, Maryland, USA. It consisted of queenright nucleus colonies of reasonable strength (five frames of bees each). On the 5th April 2009, ten strips of each type were placed on the bottom board of 20 randomly chosen colonies at this apiary. To give SHB some time to find the hiding-possibilities, the strips were left in the colonies for two nights. Then, on the 7th of April around noon at 23°C, the strips were quickly removed and the lured SHB were shaken into bright trays and immediately collected using aspirators to facilitate their counting. Afterwards, all colonies were visually and thoroughly screened using routine protocols to estimate the number of non-trapped remaining SHB in the colonies (see [1, 3] for details). This is, of course, crucial because the total numbers of SHB in the colonies must be compared with the beetle numbers found in the strips to evaluate the efficacy of each type. The two groups of colonies, which had the transparent type or the black type, were compared

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Figure 1: Transparent diagnostic strip placed on the bottom board of a hive by sliding it through the flight entrance.

Figure 2: Both types of d-strips, which efficacies were compared in the test: Transparent (original) d-strip (left; 75´500´4 mm) and black d-strip (right; 100´478´4 mm).

Figure 3: Both types of d-strips create narrow tunnels, which are used as hiding locations for SHB. Notice, that the transparent d-strips (bottom) have slightly broader tunnels than the black d-strips (top).

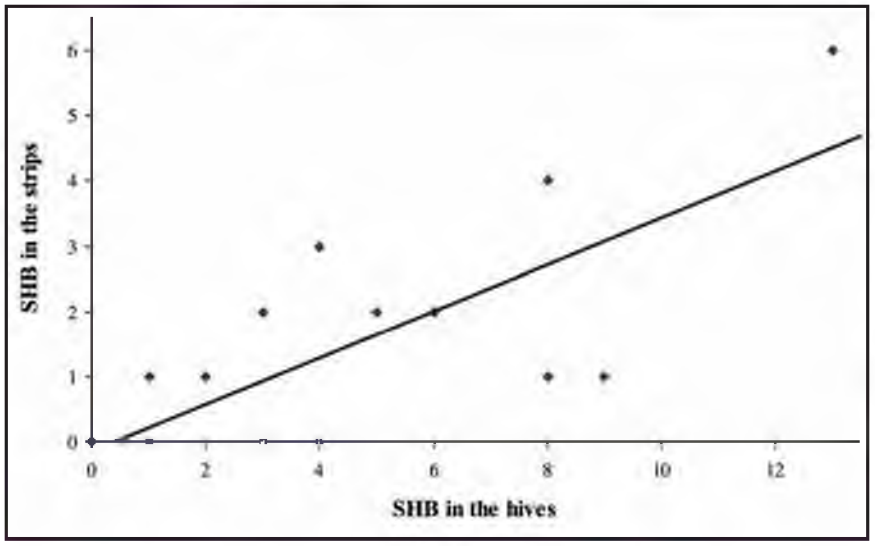

Figure 4: Overall efficacy of both strip-types (N = 20 colonies; the graph shows only 14 because some are multiply occupied). The numbers of small hive beetles (= SHB) found in the strips correlates significantly with the total numbers of beetles in the hives (Spearman's rank correlation: $r_S = 0.71$; $p < 0.001$).

with Mann-Whitney U-tests, concerning total SHB numbers and concerning the efficacy of both d-strips. All tests were performed using Statistica© (Statsoft Inc., Tulsa, USA).

The mean SHB number in all screened colonies (N = 20) was fairly low (3.95 ± 3.46; Min: 0; Max: 13) and there was no significant difference in total SHB number between colonies with the transparent strips (N = 10) or the black strips (N = 10; Mann- Whitney U- Test: U = 30.0, $p > 0.13$). The efficacy (= proportion of SHB in the strip of the total SHB number) of the transparent strips was 28.3 ± 29.6% and not significantly different (U = 34.5, $p > 0.63$) from the efficacy of the black strips (29.9 ± 24.8%). The number of SHB caught in the strips correlated significantly with the total numbers of SHB in the hives (Spearman's rank correlation: $r_S = 0.71$; $p < 0.001$; Fig. 4), which basically means that the more SHB were caught in the d-strip, the more SHB were actually in the colonies.

In examining the results, it seems that neither the broader tunnels, nor the color of the d-strips made a difference. It is remarkable, that even at the detected very low SHB infestation rates (Max.: 13 SHB), both types of strips had a mean efficacy of nearly 30%. In Australia the transparent strips detected SHB in almost all infested colonies (detection rate: 96.3%), which would make it a great detection tool to be used in places that do not have SHB yet. The black strips, probably because of the very low SHB infestation levels of this test, showed a detection rate of 70.0%. However, apiary-wide treatments are recommended in any case due to the high SHB mobility in between apiaries[3] and the high variability in efficacy. We conclude that both types of d-strips provide a fast, cheap, and easy quantitative diagnosis for SHB in the field, which is necessary for pest management decisions and especially suitable for large-scale beekeeping operations.

Acknowledgements

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Nature Has All the Answers, So What's Your Question?*

and A Page From a Treatment-Free Beekeeping Diary

by KIRK WEBSTER[1]
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Maybe we're asking the wrong questions. Or asking too many small questions instead of facing up to the bigger and more important ones.

The current decline of honey bee numbers and vitality apparently has several causes. Extensive monocultures; crop protection chemicals; the aging of commercial beekeepers; pollution; the dumping of honey and pseudo-honey from abroad; parasites and diseases; urbanization—each of these plays a role and generates its own long list of questions about the problem and possible solutions. Most people who have been around bees since the early 1980's feel that the arrival of tracheal and, especially varroa mites, is what touched off beekeeping's downward spiral, which is still continuing. Once the varroa arrived, the urgent questions came along over many years, in an order something like this: "What is varroa?"; "How can we keep them away from here as long as possible?"; "How can I kill them?"; "*Now* how can I kill them?"; "How can I kill them without poisoning my bees?" Finally, a few questions turned in a more hopeful direction: "Can we breed bees that don't need to be treated all the time?"; and "How can I raise bees of my own that don't need to be treated?"

Now we can see that the tracheal and varroa mites weakened the bees so much that all their other problems became more threatening to them. It's so much harder to keep bees alive now, and stay in business as a beekeeper, than it was in the early 1980's. On a recent trip to Iowa, it was amazing and moving to someone from rocky New England to see such a uniformly fertile countryside and the amount of corn and soybeans that are produced there. But it was also sobering to learn that, in a large state that was once a paradise for bees from one corner to the other, there are now only 10 commercial beekeepers—(the same as in my tiny state; which has only a very small percentage of its land suitable for really productive beekeeping.) With such huge monocultures, all requiring pesticides every year, productive beekeeping in Iowa is now largely confined to the river "breaks", and a few areas with dairy and mixed farming.

It's important which questions you are asking; in what order; and what you will accept as answers. Each question and answer gives a direction to your thoughts and energy. Nature really does have all the answers, as well as all of the cards. We think we have some of the cards, but we don't. In trying to create and restore balance, health and harmony—and if we care about future generations—we need to ask the right overall guiding questions. These are the ones I keep coming back to:

"How can we live by creating a better world, instead of by consuming and destroying the one we have?"

or:

"How can we tap the creative and restorative power of Nature, instead of diminishing it?"...

Sir Albert Howard—pioneer of organic agriculture science and practice

In a few different venues, I've given a presentation called *Making Varroa into an Ally*. The first photo, is of Sir Albert Howard, the British agricultural scientist who gave voice, direction, and an intellectual framework to the modern organic farming movement. (I've written about him before, in the *ABJ*—June 2006.) After a lifetime of work, one of his principal conclusions was that pests and diseases should always be seen and welcomed as friends and allies, not as adversaries to be destroyed. Their real purpose, he concluded, was to indicate where our methods, crops and livestock are weak and unbalanced, and to show the pathway to restored health and vitality.

Within a few years of the arrival of tracheal mites it was clear, in my apiary, that this principle was active and easily usable in honey bees. Still, I wondered if it would apply in the case of varroa, which was so out of balance with its new host, and with so little co-evolution. The good news is that now I an convinced that these ideas apply in this case also—the process just takes quite a bit longer to run its course. I have no doubt that varroa will, in the end, be an enormous help to both honey bees and people—as they both struggle to adapt to a rapidly changing world. It has been a great trial, privilege and thrill to watch this process at work, and it convinced me that Nature really does have all the answers, if we can just learn to be humble and ask the right questions. "How can varroa help to restore health and balance to beekeeping and agriculture?" is a much better question than, "How can I kill the little buggers?" Utilizing varroa this way is not a mystery to me anymore. It's not a mystery to Kent Anderson, (KY); or Chris Baldwin, (SD); Dan Purvis, (TN); Dee Lusby, (AZ); Danny and Binford Weaver, (TX); Hans Otto-Johnson, (Norway); Eric Osterlund, (Sweden); John Kefuss, (France); and I'm sure to many others who are not as visible.

* (Quote attributed to ecologist Howard Odum)

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(l) Michael Palmer (left) and Randy Oliver visiting my apiary in October 2008 (r) Left to Right: Eric Osterlund, Dean Stiglitz, Ramona Herboldsheimer, and Michael Bush

There are examples to follow now, and capable people with experience who can give good advice. Each one of them will tell a slightly different story—and that's as it should be because, in the end, each beekeeper has to work out his or her own relationship with his or her bees and locations. I recommend following this path to everyone; though hobby beekeepers will have to work together as a local club, and commercial beekeepers will have to move their focus to honey production and bee breeding.

When Sir Albert Howard's ideas and organic farming spread throughout mainstream agriculture, our other beekeeping problems will disappear. So another good question to ask is: "What can we do, as beekeepers, to encourage a more healthy and balanced system of agriculture that uses pests and diseases in a positive way, instead of killing them and poisoning the rest of the food chain in the process?" Every single agricultural commodity in N. America is being produced efficiently and profitably by organic methods somewhere, by one or many people. But you have to search them out—just like the beekeepers who are succeeding without treatments, their voices are often marginalized by those with vested interests in the current destructive system.

When you fly over Iowa, and it seems as though the entire state is planted in just two crops, which are both sprayed with the same herbicide during a few weeks in the spring, the thought occurs to you that they may as well just change the name of the state to Monsanto. Then, at least, there would be some transparency when we hear during a Senate debate: "I yield the floor to my colleague from Monsanto..." We should help organic farmers if we can. Farmers who can switch to organic methods now will be ahead of the curve and much more comfortable in the future, when the rest will be forced to switch by rapidly rising energy prices. Will it be like what happened in Cuba when the Soviet Union stopped supplying them with oil? Another good question...

Notes From a Treatment-Free Beekeeping Diary—January 2010; hopefully generating some good questions....

I live in a beautiful state with lots of trees and rocky hills. There's a small part of the state that's really good for bees, but for the last two years, the weather has been a serious challenge. In fact, the last good summer for bees here was in 2005. Well... 2007 was not *too* bad, and things were looking promising in the spring of 2008. A very dry and cool April and May made for a slow and steady build-up, and great conditions for selling bees and doing the spring work. My notebook says: "Best looking bunch of bees I ever sold. Because of good winter survival, it was hard to get all the good new bees into honey production." The main honey flow started late, with the best basswood flow I ever saw coming at the beginning of the flow, instead of in the middle. As the basswood ended, clover was starting to kick in, and things were looking very good indeed, with supers already filled and more piled on.

But the pattern shifted, and the honey flow ended right there as record setting rain and cold temperatures set in for the rest of the summer. In my sandy vegetable garden I often have to haul water at some point to keep the plants alive in mid-summer. But in 2008, tomatoes, carrots and corn all just up and died from having their roots sitting in water for weeks at a time. Bees were unable to forage, and started going downhill. The worst thing that happened though, was when the fall flowers also failed to yield much nectar or pollen when the weather improved in September. It took me by surprise—I've never before seen the bees uniformly fail to get into good shape for winter when it's sunny and warm in September. My dairy farming neighbors tried to explain to me how, when there's excessive rain on our heavy clay soils, the plants are unable to manufacture sugars normally for weeks after the weather improves, and the cattle feed is no good either...

In any case, the bees were in terrible shape in the fall, many of them not worth feeding. I have one yard I use just for nucleus colonies where the boxes like clockwork become heavy in the late summer and fall, and I usually have to worry about swarms coming out in August. When I checked them after extracting in 2008, there wasn't a single frame of honey in the entire yard. The colonies were all alive, but they had quit raising brood, and had tiny non-viable clusters. I should have harvested some of the queens and sent them to my friends in California as an experiment. But by October, time and energy are running out, and I was already getting behind. I blew the bees out of these, and many other large and small colonies, in December.

The following winter was cold and snowy, but nothing out of the ordinary in weather history. As expected, the bees were weak in the spring, with additional losses over the winter. Including the colonies blown out in December, the colony count was reduced to 50% of its previous peak in July of 2008. So, this became one of only two years since 1992 when I haven't been able to sell any overwintered nucs. The summer weather in 2009 wasn't much better than in 2008, the difference being that this time the rains started earlier and ruined almost the entire summer honey flow. I thought this was going to be the first time I've ever seen the honey crop fail completely in this location, but somehow the bees managed to make a small crop during the last ten days of July. At that point it seemed much better than nothing. Thankfully, the late summer and fall weather was sunny and pleasant; the bees needed feeding for winter, but were otherwise in very good condition.

Despite two years of terrible weather, and no treatments of any kind since 2002, the stability and resilience of the apiary continues to slowly improve. The cycles of collapse and recovery (now caused primarily by extreme weather rather than by mites or diseases) in the end help to build the apiary rather than tear it down. Doing the queen rearing work during the rainy summer of 2009 was not as pleasant as other years, but the results were surprisingly good, and the colony count grew from 340 to 1000 during this time. (Remember, many of those colonies are nucleus colonies intended for overwintering.) The last cycle of brood was very healthy looking, and only about 20 colonies were deemed non-viable and blown out in December. Severe weather has

(l) Breeder queens locked up (r) Beautiful bees and perfect brood in early August 2009—yes, almost all the colonies looked like this at that time

made some serious inroads into the amount of honey and nucleus colonies available for sale during the last two years, but the steadily increasing value of those commodities (especially those from untreated apiaries) has compensated for this somewhat, and a positive cash flow has been maintained without too much trouble.

The model of a healthy, treatment-free northern apiary, based on the balanced production of queens, nucleus colonies and honey has withstood many challenges since it took on its present form around 1990, and especially since all treatments were withdrawn in 2002. Reverence for, and the restorative power of Nature were consulted and utilized at every possible opportunity. Bee breeding and the rapid propagation of new colonies were used together so that bees and mites could adapt to each other through the normal insect collapse-and-recovery cycle. Economic success was assured only by the counter-intuitive process of *ignoring* economic concerns and focusing instead on the natural ability of bees and insects to be healthy, productive, and responsive to changing conditions. Much of the stress and worry has been eliminated, and beekeeping has become more interesting and enjoyable than ever before. This interest and enjoyment is available to every beekeeper who can put their own ego off to the side, think and work at the same time, and adapt Nature's methods to his of her own situation.

To end, and summarize, I include three photos as a substitute for the three well known monkeys with their hands over either their eyes, ears, or mouths. The first we could call: "Speak No Evil"; the second: "See No Evil"; and the third: "Just Evil".

The first shows two well-known and very hard working members of the beekeeping community—Michael Palmer and Randy Oliver—being extremely polite and saying nothing about the terrible condition of the bees during a visit to my apiary in October 2008. At this low point in the cycle the bees looked terrible, to me and everyone else, and I'm sure they wrote off treatment-free beekeeping as a complete hoax and not worth pursuing. The second photo shows some more friends and refugees, this time visiting the apiary in early August in 2009, just after the first *Treatment-Free Beekeeping Conference* in Leominster, Massachusetts. From left to right that's Eric Osterlund (Swedish commercial beekeeper with 200 colonies, creator of the "Elgon" bee, and editor of the Swedish beekeeping magazine—*Bitingen*); Ramona Herboldsheimer and Dean Stiglitz (authors of *The Idiot's Guide to Beekeeping*, and organizers of the Leominster conference); and Michael Bush (beekeeper and publisher of **www.Bush-farms.com/bees.htm**). They visited during one of the apiary's high points when, even after two months of steady rain and a near failure of the honey crop, the apiary had expanded to three times the April colony count. Every frame of brood seemed to be perfect, and it was hard to find mites or even a single bee with bad wings. Now.... these are my people, but I have to point out that they also left with a mistaken impression—it looked much too easy. The truth is somewhere in between what my two groups of visitors took away with them. The important point is that the system keeps functioning throughout—able to take advantage of any and all favorable conditions that come along; and still survive extreme weather or biological challenges—even benefiting from them in the long run.

Close-up of brood—August 2009

The third photo (top, left of this page) is one that I hate to show, but I just don't believe any real progress can be made by hiding or denying aspects of reality. This is a breeder colony that is locked up because other queens and colonies have been stolen in the recent past. Several of the people who have succeeded in developing apiaries that can function without treatments have been subjected to a similar and disturbing pattern of theft and other forms of harassment. This is surely the most pathetic and destructive response of all—doing nothing to help the industry recover from its current difficulties, and damaging everyone involved. Each individual, untreated apiary has to be built up gradually over four or five years, as a joint project between the bees and the owner. Once such an apiary exists, maintaining it requires the same skills, work and quality of attention that created it in the first place. The end result cannot be bought, sold, connived or stolen. The starter stock for such an apiary can now be purchased from several sources, always for a tiny fraction of what it cost the owners to develop these stocks, and for a tiny fraction of their future value if they are propagated and and selected intelligently.

We can finish on a related, but more positive note by returning to my friend Eric Osterlund and his apiary. I've had the privilege of knowing Eric for many years, and he has in fact been harassed by some members of the Swedish beekeeping "Establishment" for allowing the publication of many articles about beekeeping without treatments—in Europe, North and South America, and the Middle East. But far more interesting is the case of his own apiary. He lives in south-central Sweden, where varroa mites were not observed until 2007. I find it hard to be-

Molly Lohman holding a frame of brood for the first time—late September 2009. Despite terrible summer weather and near failure of the honey crop, brood remained healthy right to the last round.

lieve that anyone on earth was better prepared for the arrival of varroa that Eric. More that a decade before the invasion, he was already seeking out survivors from infested areas and stocks that could have potential mite tolerance. Every year he propagated his bees from these survivors and promising races and sent daughters to his friends in mite-infested districts to be tested and to become future breeders. He fell under the influence of Ed and Dee Lusby and the small-cell cartel; started buying foundation mills and replaced all his combs with 4.9 foundation. Years before the mites arrived, his hardy and productive bees had tested survivor parents on both the male and female side, and were completely adapted to the small-cell combs. I often joked about mailing him some mites so that he wouldn't have to send his breeding stock back and forth across Sweden and Europe....

When the varroa mites finally arrived and started to multiply in his home town of Hallsberg, Eric's apiary fell apart just like every other apiary did when first exposed to this pest. He lost 50% of his bees between August 2008 and May 2009, and felt certain he would have lost 90% if he hadn't made an emergency treatment with thymol. Hopefully, all of his preparation and hard work will result in a comparatively quick recovery from the initial shock—maybe like what John Kefuss experienced when he abandoned treatments after years of trying to breed for resistance while still artificially controlling mite numbers. I think Eric's case provides additional and very clear evidence that bees and mites must live constantly together in order to develop genuine tolerance, health and resilience for future apiaries; that both known and unknown factors are involved in the process; and that the collapse-and-recovery cycle needs to be embraced and utilized, rather than feared and avoided.

"Nature has all the answers, so what's your question?"*

55 Years of Beekeeping · 55 Years of Beekeeping · 55 Years of Beekeeping

Florida's Laurence Cutts Recalls His First 55 Years of Beekeeping

by Cecil Hicks

When third-generation Florida beekeeper, Laurence Cutts, began keeping honey bees full time Elvis Presley hadn't yet recorded "Blue Suede" Shoes" and it would be another 15 years before astronauts would land on the moon. The year was 1954 and he was a young man a few months removed from his high school graduation when he made a career decision to join his daddy, Paul, raising honey bees in the family business. It was a decision that he never regretted.

Laurence Cutts stands alongside a couple of his beehives located near his bee shop. The Weather in January 2010 was cold and wet. A few days before this photo was taken, water from a nearby drainage ditch surrounded the hives.

55 Years of Beekeeping · 55 Years of Beekeeping · 55 Years of Beekeeping

He never spent any time in the military because he said he was too young for the Korean War and too old for Vietnam. Today at the age of 74, you might say he is semi-retired, but he still manages some 150 hives. At the peak of his beekeeping career, he once ran 2,222 hives. He remembers that at that time he and his brother, Jimmy, and his brother-in-law, Ernest Weiss, were partners. "We had two full time employees and as many as five part time workers in the spring. My daddy and momma also continued to help, especially in the spring. We made increases each summer to replace dead-outs and to grow bigger. One fall, when I added up all the yards, we had 2,222 colonies. I don't recall the year, but the number was easy to remember."

His grandfather James Monroe Cutts first started a commercial bee business in 1889 at Montgomery, Alabama. In 1943 the business moved to Chipley (current population 3,600) in the panhandle of northern Florida. In 1915 his daddy took over raising bees and shipping queens. For years the honey business name was J.M. Cutts & Sons. Today, Laurence sells honey under his own label of Cutts Honey.

Some of his first beekeeping memories were of him helping his mother, Inez, run the family queen yard. His usual job as a kid was putting out nucs to be made up and catching queens. It wasn't until a few years later that he began helping care for bees in his daddy's outyards.

For 65 years the family's primary bee business and main source of income centered around selling queens and package bees to customers in Canada. However, this lucrative business arrangement ceased abruptly in 1984 when tracheal mites swept through hives all across the United States and Canadian government officials banned bee shipments from the U.S. in an attempt to keep mites out of their country.

As a result of this ban, the Cutts family bee business was devastated and according to Laurence, "I tried to switch over immediately to honey production with my bees, but I didn't have the equipment and wasn't set up to produce honey. It also didn't help that it was a poor honey season." The bottom line resulted in bankrupsy. At that time he was on the board of the Florida State Agriculture Advisory Council as a beekeeping representative and he was asked if he was interested in working for the state as its chief apiary inspector. He took the job and began work on June 21, 1985. "I remember it was the day before my 50th birthday and it was also the first salaried job I ever held."

He claims that some year when he doesn't have anything else better to do, he's going to write a book about his experiences. According to Laurence, during those 18 years of service the Florida bee industry had more major problems than "all past state beekeeping history combined." Some of these problems, that he and his team of 17 apiary inspectors, two secretaries and a lab tech, tried to resolve ranged from bad nutrition and stress, regulating pesticide and insecticide spraying of agriculture crops, as well as city and county mosquito abatement spraying programs, infestations of mites (tracheal and Varroa), small hive beetles and then the arrival of Africanized Bees. He retired in 2003 before CCD problems appeared in the state.

Third generation beekeeper Laurence Cutts points to a picture on his office wall of his grandfather, J. M. Cutts, who started keeping bees back in 1889.

The tree-covered shorelines of the lakes and rivers of the panhandle country of northern Florida are prime honey bee foraging regions for making premier tupelo honey, especially along the Apalachicola River.

Although the state was faced with a plague of bee problems over the years that he and his inspectors encountered, he said it also provided him with the opportunity to travel, meet and work with some of the most dedicated bee research workers in the world from the U.S. Department of Agriculture labs. "It just irritates me when I hear beekeepers complaining about these researchers that are trying so hard to find solutions to bee industry problems."

For example, he named two of these dedicated researchers (Dr. Frank Eischen, a bee entomologist at the Weslaco, Texas lab and Dr. Jeff Pettis, an entomologist at the Beltsville, Maryland lab) that he's worked with between his involvement with Africanized Honey Bees and small hive beetles. He recalled how Jeff Pettis, while gathering research data on the life cycle of the small hive beetles, would lie out on the ground observing a beehive that was infested with small hive beetles, watching it night-after-night until finally all the beetles in the hive crawled out at once to pupate in the ground near by.

Besides being a full time commercial beekeeper, he was heavily involved for decades with the Florida State Beekeeping Association (FSBA) as a former president. He attended his first Florida State Beekeepers meeting in 1947 when his daddy was elected president. Laurence served as president for the FSBA on three different occasions. The first was in 1976, the year his oldest daughter, Rhenea, was the state honey queen. He recalls doing an auction fund-raiser for the banquet that year and has held that job ever since.

As president of the FSBA over the years, Laurence has given numerous talks and presentations to community leaders and organizations discussing Florida beekeeping problems. He's also been featured on television news programs and in the print media promoting the honey bee industry. Also, as Florida's chief apiary inspector, he's provided numerous instructional bee programs including bee eradication training, along with swarm removal and testing for Africanized Honey Bees for agriculture quarantine inspectors, custom officials and cruise ship industry officers. He's also helped develop bee legislation for the state.

He and his wife, Eloise, raised six children, three boys and three girls at their home in Chipley. Regretfully, Eloise died eight years ago. Except for the grafting, Laurence said, Eloise pretty much ran the queen yard and did everything from putting in cells to catching queens.

Today, two of their sons help him with the bees, but it's not full time. He also has three grandsons who will help part time on weekends and during the summer as needed.

Laurence said beekeepers are still talking about what a poor honey year 2007 was all throughout the southeast. He said it was just an all around bad year for everybody as it was unseasonably hot, wild flowers had dried up in what was an extended two-year drought.

He related the following story about that season: "I had pulled honey supers from my beehives that had been on popcorn honey (Chinese Tallow Trees) and took a trip for three weeks to Australia in September (which is part of their winter) to attend the international beekeepers Apimondia conference held in Melbourne. By the time I got back, most of my bees had died. It was my own fault for not leaving the bees more food or making arrangements for somebody to check and feed the hives."

Besides the bee losses from 2007, Laurence said he's been pretty successful in recent years raising bees and hasn't had any other major problems.

While shipping bees in the winter

This is Laurence Cutts' bee shop located near his home at Chipley, Florida. At the age of 74 he still maintains some 150 hives.

Laurence stands at the back of his extraction room in his bee shop. He ships most of his honey to a packer for sale.

months to California almond orchards for pollination and receiving $140 per contracted hive might be the big thing currently in our nation's bee industry, he doesn't ship bees to that state. Laurence said, "It's just too far, I have too few hives and its too expensive."

However, Laurence said each year Florida beekeepers will ship approximately 100,000 colonies out of state to some 26 other states for crop pollination. Bee pollination contract rates will range from $25 to $140 per hive depending upon the crop. He added that Florida beekeepers will ship about 40,000 hives to New England states alone for the blueberry pollination season.

At the start of the year in Florida's panhandle his bees make tupelo honey at five different locations along the Apalachicola River. Later his hives will be moved to yards along the Choctawhatchee River where the first honey crop from this location is from the titi plant. Later his bees will forage in the tupelo trees in the swamps from their yards set in flat pinewood forests nearby. By the first of June most of his bees are placed on farmland around Chipley for popcorn (Chinese Tallow Tree) honey making, plus some of his hives will be set in cotton fields. Each spring he'll also sell some 250 nucs.

Laurence said tupelo makes a popular and superior tasting light colored honey that attracts a good price and is highly sought by people for medical reasons. He explained that a drum of tupelo honey sells for a premium price of around $2.25 per pound, while other kinds of honey would fetch a normal price of about $1.25 per pound.

He noted that in the Florida panhandle tupelo beekeepers historically had a reputation as being quite protective about their traditional beeyard sites that have often been passed down through family members for generations. In the past, woe be it if a newcomer encroached and moved in on top of another beekeeper's territory. The end result often led to the outsider's bees dying off mysteriously from poison or fire. He said he thought it's been about 15 years since he last heard of any reports of similar type of occurrences.

He suggested that today, if somebody wanted to move bees onto tupelo trees in his region, it would be best to contact a local commercial beekeeper and lease out their bees through a business arrangement that would split the honey income. "I did that once a few years ago when I shipped my bees to a friend in North Dakota. After all, he knew his territory, he was familiar with their local flowering plants, he knew when the honey flow would begin and he was available to check yards and add supers on a regular basis. It was a win-win situation."

While Laurence runs mostly medium-depth bee boxes, he does have a combination of some deep and shallow supers. He paints all his medium and deep hives white, but his shallows are a rainbow mixture. It could be just about any color paint as he sometimes will pick up partially full paint cans from an attendant at his local land fill. "It's free, so whatever they have available is fine with me."

Gordon Clauss (on left) and Laurence Cutts man their Better Beetle Blaster vendor booth at the January 2010 American Beekeeping Federation's conference in Orlando, Florida.

After extraction, nearly all his honey is placed in drums for sale to a packer except for some he keeps for family, friends, bee yard rentals and a little for local sales. Last year his bees produced 24 barrels of honey. He said, in some years he's produced more than 40 barrels from the same number of beehives. Most of his honey is shipped to Golden Heritage Honey Company in Hillsboro, Kansas.

At his home in Chipley, Laurence has a 32 feet by 60 feet honey house and woodworking shop along with a pole barn used for storage of bee equipment and honey supers. The pole-structured building also houses a honey storage room designed with central controlled heating during the colder months and air conditioning for summers that lowers the humidity and keeps small hive beetle eggs from hatching.

During the winter months he'll keep busy mixing sugar water and feeding his bees until early March when they'll start foraging on bloom.

He has two pickups and a one ton bee truck used for transporting beehives to yards. He laughs when he explained that although he has five Bobcats (forklifts), "only one runs." His honey extracting system is a Cowen in-line 60 frame extractor and uncapper. After extraction, the honey is pumped to a 300 and a 600 gallon holding tank for filling drums.

He also uses an old freezer-style reefer semi-truck for super storage that's under a tin pole barn structure. By stacking supers in the truck for most of the winter, it kills off the wax worms so the supers are ready to place back on beehives in the spring. He also has an enclosed trailer bed truck he uses for queen storage and queen grafting.

If you step into his office/library, also constructed under the pole barn, you'll see an array of beekeeping books that he's collected over the years, along with a number of memorabilia. On the wall he can show you family pictures of his ancestors including his grandfather, J.M. Cutts, who started the family bee business in 1889.

There's also a film poster on the wall of the Peter Fonda beekeeping movie called "Ulee's Gold." The movie was filmed in Florida and Laurence was the beekeeping consultant. He said, "if you ever see the movie and watch the very last of the credits it says thanks to Laurence Cutts, chief apiary inspector for the Florida Department of Agriculture and the bees."

To date (toward the end of January 2010) it has been cold and wet and Laurence said he recently moved some bees near the swamps and he only stuck his bee truck in the mud once and had to get a tractor to pull him out. Recent rains also filled up a run-off ditch and flooded several inches of water into his yard. The water surrounded a few hives until it receded near his bee shop. He reflected that, "It was a good thing I had the hives sitting on pallets."

Although he retired as Florida's chief apiary inspector in 2003, he still keeps busy with the bee and honey industry by managing his 150 hives. You'd think that by the age of 74, after he spent the last 55 years as a beekeeper, that Laurence would be ready to move on into full time retirement, but not so.

According to Laurence he's still having too much fun. In fact, he recently designed a new non-chemical, inexpensive and disposable small hive beetle trap he named the Better Beetle Blaster. He teamed up with fellow Florida panhandle beekeeper and friend, Gordon Clauss (of Youngstown) to produce, promote and market it. Gordon manages some 150 bee colonies and also operates an embroidery business.

The beekeeping duo began selling their new product in October of 2009 and reported brisk sales. They also manned a Better Beetle Blaster vendor booth at the recent "Keeping the Hive Alive" bee conference held in January 2010 in Orlando, Florida. You could say Laurence Cutts' future will most likely involve bees, beetle blasters and books.

Trouble in Paradise: Varroa Spreads Across Hawaii

by Dr. STEPHEN J. MARTIN

The Hawaiian Archipelago is comprised of eight islands surrounded by thousands of miles of open-ocean. Among the islands, Oahu, is the most densely populated, and Honolulu, with almost a million people, is the most isolated population center on Earth. However, despite its isolation in April 2007 the insidious ecto-parasitic honey-bee mite *Varroa destructor* was first detected on the main island of Oahu and in 2008 had spread to Big Island, a major beekeeping center. The impact of Varroa on Hawaii could be more devastating than usual due to the unique ecology and climate of these remote islands.

Hawaii lies almost 2,400 miles from the U.S. mainland and 3,900 miles from Japan. It consists of a chain of islands formed by volcanoes erupting from the sea floor as a tectonic plate moves slowly northwesterly over a hot spot. Therefore, the geology changes dramatically from the oldest islands of Kauai to the youngest island of Hawaii (also called Big Island to avoid confusion).

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This explains why only Big Island has any active volcanoes, and is where the world's largest mountain Mauna Kea is found, rising 32,000 ft above the sea floor. Lying at the same latitude as Mexico City, Hawaii enjoys a tropical climate. The commercial hub is based around Honolulu on the island of Oahu and so it was not surprising that in 2007 Varroa was first reported in three abandoned hives in Makiki, an area close to the center of Honolulu. However, a subsequent survey of honey-bee colonies of Oahu (both managed and feral hives) revealed that Varroa was already widely distributed across the island (**http://hawaii.gov/hdoa/pi/ppc/varroa-bee-mite-page**). This indicates that the original invasion had occurred at least 1 or 2 years previously. Much speculation revolves around how it arrived; some people blame the trans-national movement of goods including bees in transit through the Honolulu airport. However, the more likely route is via the accidental transportation of an infested colony from the mainland US, since the majority of goods in Hawaii are imported from the States. Genetic data from the mites and their associated viruses may help elucidate the arrival route, but this information is of little help to beekeepers since it is almost impossible to eradicate the mite once it has become established within the feral honey bee population.

Honey bees were first successfully established in Hawaii in 1857 using three colonies of German dark bees (*Apis mellifera mellifera*). These were followed by imports of Italian bees (*A.m.liguistica*) in 1880, and later imports of *A.m.carnica* and *A.m.caucasica* queens. Major beekeeping operations were established on all the main Hawaiian Islands where honey bees quickly established themselves as large feral populations. It is currently estimated by researchers at the University of Hawaii (UH) that on the Big Island hundreds of thousands of feral colonies exist. For a detailed account of the History of Beekeeping in Hawaii, see the excellent account by Roddy and Arita-Tsutsumi (1997). As of 1909 no serious bee diseases e.g. American foulbrood (AFB), were present so further imports of bee packages were prohibited. However, despite this restriction, AFB was introduced in 1930 to the island of Maui where it wiped out many of the managed colonies. Nevertheless, many typical pests of honey bees like the Tracheal mite (*Acarapis woodi*) and the bee louse *Braula sp.* are still not present in Hawaii, although the presence of other pathogens such as *Nosema cerana* and *Nosema apis* may suggest more recent imports of honey bees to the islands.

Among the Hawaiian Islands, the Big Island has long been associated with beekeeping. As the name suggests this is the largest of the Hawaiian islands, and has the most

Beekeeping on the spectacular island of Kauai- Hawaii. (All photos by Dr. Stephen J. Martin.

The islands of Hawaii with the stars indicating where Varroa is currently found.

The University of Hawaii-Manoa (UH) bee team L-R are Scott Nikaido, Ethel Villalobos and Mark Wright

varied environments that range from lush tropical forests in the east to dry savannah in the west. The variety in microclimates found on this island supports a wide range of economies such as coffee, Macadamia nuts, and cattle ranching. Honey bees have had a long and close association with the economy of the Big Island. Initially, around 10,000 honey-bee colonies were placed on Algarroba, a type of Mesquite, known locally as Kiawe, and used for cattle feed. Algarroba produces quality white honey. More recently, the west (dry) coast of the Big Island has become the home to several major queen rearing operations. The tropical conditions, wide variety of plants and predictable weather patterns allow Hawaiian queen breeders to produce mated queens at any time of the year. There are also many honey producers on Big Island, both big and small, but the most unusual is the range of pure white organic honeys produced by Richard Spiegel. Therefore, protecting the spread of Varroa from Oahu to the Big Island was a major priority. However, despite the establishment of bee-free buffer zones around the major Oahu ports in August 2008, Varroa was found in a swarm in the port area of Hilo on the Big Island.

In 2009, an attempt to eradicate Varroa was made. This involved using fipronil to kill all honey-bee colonies within a five-mile radius of the original outbreak using 200 bating stations, and the manual removal of feral colonies. However, despite a major effort, it failed and by November 2009, Varroa was been reported from many locations, including places on the opposite side of the island from Hilo. The speed of the spread of Varroa on the Big Island surprised the Hawaiian beekeeping community, but this is not unexpected since within 50 years Varroa has spread around the world, reflecting the truly global nature of beekeeping.

During 2009, efforts moved from mite eradication to control and education. This is the key function of a small but dedicated team of entomologists from the University of Hawaii-Manoa Department of Plant and Environmental Protection Sciences, with two additional field-officers based on the Big Island. During 2009, they helped successfully test a new formulation of Mite AwayII (formic acid) since the high tropical temperatures made standard formic acid treatments too toxic for bees.

It still remains unclear if full Apistan resistance is currently present among the Hawaiian Varroa populations, but limited testing suggests that some elevated level of resistance may be present, although Apistan was used successfully for mite monitoring. The task now facing UH researchers and Department of Agriculture is supplying the Hawaiian beekeepers with mite control measures and investigating the wider impact that the spread of Varroa will have on pollination services. This is particularly important since Hawaii has an agricultural economy built on many imported (i.e. non-native) species which have benefited from a 'free' pollination service provided by the large feral honey-bee population. It is too early yet to see the full impact that Varroa will have but already one Melon Farmer on Oahu has switched crops due to the failure of his melon crop. Whether this is linked to the loss of a free pollination service is currently being investigated by the bee-team at UH. What is clear is that Varroa will spread to and kill the vast majority of feral honey-bee colonies on Hawaii as it has done in other parts of the world. Until the collapse of the feral honey-bee population, the Varroa population will boom and cause potential re-infestation problems for beekeepers.

The tropical climate of Hawaii is a double-edged sword, since although it allows honey bees to rear brood all-year-round; it also allows the mites to breed continuously. Therefore, mite populations will build up much quicker than in temperate climates, so reaching threshold values much quicker than in temperate regions. However, threshold values are influenced by the complex interactions between Varroa-associated viruses such as Deformed Wing Virus (DWV) and the average honey-bee lifespan (Sumpter & Martin, 2004). This is due to the viruses transmitted by the feeding activities of the mite and not the mite itself that leads to the collapse of the colony. In tropical areas, the good conditions allow bees to forage almost continuously so there is a rapid turnover of bees and this is predicted to increase the number of mites needed to kill a colony. The team at UH is collecting the data required to develop the models required to determine the complex interactions be-

(l) The famous Ni Pali coast on Kauai, an example of large areas of Hawaii that are inaccessible and contain a large feral honey-bee population. (r) Requeening operation on the Big Island, continuous egg laying means queens need to be replaced every year in large operations.

The UH-field worker Maria Diaz-Lyke sampling feral bees from the Big Island.

tween mite and bee reproduction. DWV has already been confirmed from bees on Oahu and Big Island. For scientists, researching honey-bee diseases, including colony collapse disorder (CCD), the spread of Varroa across Hawaii provides a unique opportunity to see how it is changing the viral landscape. This is possible since by collecting bee samples from many Varroa-free colonies, we can determine using molecular methods, what natural honey-bee viruses are present in what colonies. We can then resample these colonies after they have been infested by Varroa and investigate how the viral pathogen profiles have changed. CCD has not yet been reported from Hawaiian beekeepers, but the arrival of Varroa and its associated viruses may change that.

Fortunately, Hawaiian beekeepers have hindsight on their side, since we now know how to control and manage Varroa, and there is absolutely no need to introduce Africanized honey bees (AHB), as has been suggested. Although AHB are resistant to Varroa and would thrive on Hawaii, the problems associated with their highly defensive nature would affect the tourist trade and decimate all queen breeding. The challenge now is to determine the role of honey bees as pollinators for large-scale agriculture, especially in the important Macadamia nut and vegetable industries, since the Hawaiian pollinator community will be unique. Also, efforts should be made to prevent the spread of Varroa to the other Hawaiian Islands, but the large amount of inter-island traffic and physical proximity of the Big Island too Maui are likely to cause the mite's inevitable spread.

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Does Breeding in the Honey Bee Result in Higher Winter Losses?

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Some believe that the breeding of honey bees merely for greater yield is responsible for winter losses among bee hives. So far, no evidence has been provided for this hypothesis. In this paper, an attempt will be made to present the relevant correlations in a more differentiated way and to consider the facts.

The Possible Cause: High Milk Yield and Fertility Problems in Dairy Cows

The concept that breeding for greater yield and for vitality generally are mutually exclusive has resulted from the examination of dairy cows. Some of these studies have shown that, in the population of dairy cows in the USA, in which selection is highly practiced, the incresase of success in breeding for milk also increases problems with fertility. Indeed, highly productive cows have a much higher metabolism, which may occur at the expense of normal reproduction. However, doubts are justified as to whether this situation can be applied to other types of animals, and more specifically to the honey bee. In the honey bee, the correlation between metabolism of individual bees in the hive and the honey production of the hive is less pronounced. Nevertheless, one cannot completely reject this association. Notably, in contrast to milk, honey is not a product of the bees' metablism, but depends on the capability of the bees to find and process nectar efficiently. Is it unrealistic to say that a high honey yield is an indicator of the vitality of a colony? Moreover, a direct comparison between most domestic animals and bees does not apply for the following reason: The aim of the breeding of most domestic animals over the last few decades (here, changes have occurred in the breeding of large animals) has been concentrated on one particular aspect of their productivity. In the honey bee, however, several behavioral characteristics have to be taken into account, apart from their honey yield. The simultaneous consideration of several characteristics means that any selective breeding program cannot be one-sided and therefore the reduction in genetic variability progresses more slowly.

High winter losses are a problem in many countries. According to the presented data, breeding colonies and normal colonies overwinter equally well.

Are Winter Losses Higher in Countries with Intensive Bee Breeding?

If the argument that intensity of breeding leads to large losses is to be supported, then countries with negligible levels of bee breeding should show lower loss rates in their bees. Following the high losses during the winter of 2002/2003, an EU-wide statistical study was commissioned (Bee Mortality and Bee Surveillance in Europe; **www.efas.europa.eu**). The resulting data contained not the slightest evidence that Germany, which practices comparatively intensive bee breeding, had higher winter losses (13% in 2006 and 9% in 2007) than countries with less intense or lack of breeding programs for bees.

How Intensive is Bee Breeding in Europe?

Let us return to the example of cow breeding, which has presumably been the inspiration for accusations against the breeding of the bee. The success of the North American and European breeding of dairy cows has a simple explanation: Only a few bulls with an excellent breeding value for milk yield are used as sires. As ca. 90% of the cows are artificially inseminated, a large percentage of the offspring of the whole population are descended from a comparatively small number of sires. What is the situation in the case of the honey bee in a country with comparable intensive breeding levels in this species? Only 0.6% of the bee hives in Germany are breeding colonies, and only 7.5% of all queens in Germany (of ca. 800,000) are inseminated artificially or mated under controlled conditions. Thus, in the case of dairy cows, almost the whole poulation is influenced by breeding,

whereas in the case of bees in most countries, the percentage affected by breeding is only small. The suggestion that a breeding program results in higher winter losses has therefore not been established. However, even if this suggestion were indeed the case, it is improbable that the comparatively small influence of breeding would cause such high losses within the general honey bee population, which is often maintained by uncontrolled natural mating. The influence of breeding on the whole population is comparatively small in most countries. However, is it in any way negative?

Are Winter Losses Higher in Breeding Colonies Than in 'Normal' Colonies?

Are winter losses higher in breeding colonies? Inbreeding is an extreme form of selection. Indeed, inbreeding, if skillfully used, can speed up the selection process and its success. Inbreeding occurs when related animals are bred with with one another so that their offspring will be more likely to carry identical genes by descent. This combination of identical genes can lead to a lowering of the vitality of the inbred animals. Inbreeding is known to be especially dangerous in the honey bee (Bienefeld et al. 1989). This is caused by the mode of sex determination, resulting in diploid drones, which are eaten by the worker bees (Woyke 1963). Should signs of lower vitality and higher losses occur, then this would be expected to be most probable among breeding colonies. To test this, 84 breeders from Germany and 10 breeders from Austria recorded overwintering results from 5598 hives (2305 in the winter of 2006/2007 and 3239 in the winter of 2007/2008). As a comparison, winter loss data from the German Bee Mortality Monitoring Program (Genersch et al. submitted) is suitable, as this program also attempts to explain winter losses. These data come from ca. 120 representative beekeepers who are spread throughout Germany and whose hives are typical of German beekeepers. Should the suggestion that breeding is partly responsible for winter losses be true, then the loss rate should be significantly different among breeding and 'normal' hives. The data from Table 1 do not permit this conclusion to be drawn.

The suggestion that bee breeders are especially good beekeepers and therefore fewer losses are to be expected in their apiaries cannot be rejected. However, the beekeepers involved in the Bee Mortality Monitoring Program also became aware of the key issues during the investigation so that the two sets of averages appear comparable.

Should Greater Winter Losses be Expected at Apiaries with Genetically Superior Colonies?

Notable and statistically significant differences exist between breeders with regard to genetic levels (honey and gentleness) and the level of inbreeding of the colonies. If accusations based on bee breeding are indeed true, then locations with especially high quality breeding colonies should show greater losses. Results have been obtained from the locations of the involved breeders concerning performance testing, breeding values, and pedigree information in order to be able to answer this question.

Time period	"Normal" colonies	Breeding colonies	
		Germany	Austria
2006/2007	8.8%	8.9%	-
2007/2008	15.9%	14.6%	14.7%

Table 1. Percentage values of colony losses during the winter of 2006/2007 and 2007/2008 at apiaries of beekeepers participating in the Bee Mortality Monitoring Program ("normal" colonies) and breeding colonies.

			Honey		Gentleness	
Winter losses	Number of hives	Inbreeding	Weight (kg)	Breeding value	Grade	Breeding value
<10%	106	3.3%	40.1	103.2	3.48	102.2
10%-25%	36	2.4%	35.3	102.9	3.50	102.1
>25%	29	3.2%	36.4	101.4	3.31	98.7
Statistical significance	-	None	None	None	None	None

Table 2. Average genetic level and inbreeding of hives with lower than average (<10%), above average (>10%), and higher (>25%) winter losses in the two winters 2006/2007 and 2007/2008. The provided inbreeding data give the average of the inbreeding of queens and workers of the hive. Inbreeding and breeding values of the colonies were obtained from www.beebreed.eu. The values of the gentleness of the bees were subjectively recorded after the point system of Ruttner (1972), whereby 1 is the worst grade and 4 is the best. A breeding value of 100% represents the average value of the breeding population of the recent five years.

Although differences occur concerning the genetic levels between the colonies of the beekeepers, these genetic differences are not linked with winter loss. No significant difference concerning honey yield and the breeding values for this characteristic exists between apiaries with low and high winter losses. Even genetically "gentle" hives, which are often accused of a lack of vitality, do not show higher winter losses (Table 2). Table 2 instead shows the opposite tendency: Apiaries with high average performance and gentle behavior (and higher breeding values for these characteristics) exhibit fewer winter losses.

Thus, in many respects, the situation of the honey bee cannot be compared with that of other domestic animals. Moreover, the data presented here does not show that the breeding of bees in Germany can be correlated in any way to high winter losses. Even after 4 years of bee mortality monitoring, the causes of the temporally or regionally based high winter losses are not completely known. However, the finding that the Varroa mite, combined with viruses, plays a central part in these losses cannot be denied (Yang & Cox-Foster, 2005). In some European countries, resistance to the Varroa mite is a central characteristic that is considered in honey bee breeding. The first successes have become apparent (Büchler et al 2007, Harbo & Harris 2009, Rinderer et al. 2001). Hope is therefore justified that the efforts of breeders will have exactly the opposite result to the accusations made against them—fewer winter losses through breeding.

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A Network for Monitoring Honey Bee Mortality and Colony Losses in Italy as a Part of the APENET Research Project

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Summary

Honey bee and colony mortality have been reported for several years in many countries as well as in Italy. In the last years this phenomenon has become increasingly serious, and several hypotheses have been proposed to explain honey bee and colony losses. These hypotheses relate to pests and diseases, pesticides, apicultural practices, climate change, electromagnetic fields, GMO crops, etc. Honey bee colony losses are being surveyed in several European countries, but these surveys are not sufficiently structured. Based on beekeepers' reports, honey bee losses in Italy follow a clear seasonal pattern: a) during spring and summer colonies lose many foragers due to agrochemicals (bee losses); b) from late summer to winter, the impact of pests (including Varroa) and pathogens becomes more important (colony losses). To assess the extent and investigate the possible causes of honey bee and colony losses in Italy a national monitoring network needs to be established. Target apiaries will be distributed in selected sites (modules), ideally one per region, to cover the national territory. Each module, composed of five apiaries with ten non-migratory colonies each, will be chosen based on environmental characteristics with a distance to the center of the module of about 50 km. Colonies will be visually inspected four times a year (right after winter, spring, summer and just before winter). In each inspection several parameters of each colony will be considered—health and nutritional condition, number of bees and brood, and queen's age. The person in charge of each module will input the information obtained in a real-time database available on the Internet. In addition, dead and live bees, as well as several beehive matrices (brood, pollen, wax) will be collected during each inspection for chemical, pollen and disease analyses. The information collected through this honey-bee monitoring network will provide a broad database from which to explore patterns of disease, toxic exposure and management practices that may be linked to the occurrence of honey bee and colony losses. APENET aims at providing an accurate assessment of the overall health condition of honey bees at the national level.

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Introduction

Honey bee and colony mortality have been reported for several years in many countries, as well as in Italy. In the last years this phenomenon has become increasingly serious, and several hypotheses have been proposed to explain honey bee and colony losses (Oldroyd, 2007; Mutinelli & Granato, 2007). Different countries in Europe, as well as US, have already activated specific monitoring programs. Current knowledge about bee hives losses is indicative of a multifactorial syndrome where different causes are involved: bee pathogens and pests; treatments with agrochemicals; beekeeping practice; climate, nectar flow reduction; low quality of pollen and changes in agricultural practices. Electromagnetic pollution, as well as GMOs, have also been considered (Mutinelli, 2008; Porrini, 2008; Tesoriero *et al.*, 2005). Particular attention is paid to treatments with agrochemicals carried out in spring-summer in intensively cultivated areas. These substances can be highly toxic to bees with clearly detectable clinical effects in some cases, but in other occasions they are not and it appears very difficult to establish a link with mild clinical symptoms and bee mortality. As an example, neonicotinoids used for maize seed dressing, microencapsulated pesticides and insect growth regulators (IGRs) can be mentioned. The active ingredient can be effective at very low dosages causing disorientation and altered behavior likely responsible for colony losses (Bortolotti *et al.*, 2003; Medrzycki *et al.*, 2003).

In Italy the first reports of bee mortality and colony losses are dated 1999 and concentrated in spring-summer at the time of maize sowing. However, mortality is now recorded also in autumn-winter. Bee mortality is recorded in four different periods and associated to different conditions: 1) January-February as a consequence of queenleesness or insufficient food storage; 2) March-April in coincidence with sowing of some crops (Greatti *et al.*, 2003; Greatti *et al.*, 2006) and during the first treatments on fruit trees; 3) June-July at the time of treatments of vineyards against *Scaphoideus titanus* (Sgolastra *et al.*, 2005); 4) late Summer-Autumn when the Varroa infestation is particularly severe and associated to other pathogens (Nazzi, 2008) compromising the further development of the colony.

Based on beekeepers' reports, honey bee losses in Italy follow a clear seasonal pattern: a) during spring and summer colonies lose many foragers due to agrochemicals (bee losses); b) from late summer to winter, the impact of pests (including Varroa) and pathogens becomes more important (colony losses). In order to better understand the observed phenomenon, the establishment of a national monitoring network is highly recommended.

Network and methodology

In collaboration with beekeepers and research institutions, areas where to locate the monitoring module have been identified in each region. Each module is composed of five apiaries, each consisting of 10 hives. Ideally, a distance of approx. 50 km should be considered among the apiaries. This approach should provide relevant information from different territories of a region and limit the expenses related to the management of the module itself. Four times a year (after winter; in spring; in summer; before wintering) (Chauzat *et al.*, 2006), the hives will undergo accurate inspection by the person in charge and data about health status, nutrition and colony strength will be registered. Ap-

propriate forms will have been prepared and made available for data recording. The data then will be input in specific software available on the web. Samples of different hive matrices (live and dead bees, brood, wax, pollen) are collected and analyzed. All the hives will be managed according to good beekeeping practices and should not differ from those not included in the monitoring network. The only specific requirement is that non-migratory hives must have been selected. Accordingly, hives are inspected four times a year, but any alteration, e.g. anomalous behavior, altered development rate, mortality outbreaks and disease onset, recorded during the year (outside the 4 scheduled inspections) should be registered. The people in charge of the module must have attended a training course in order to establish a common inspection procedure and to avoid any subjective interpretation during the inspection. People will have been trained on data collection, form completion, use of the software, sample collection, storage and dispatching. The person in charge of the module carries out the scheduled inspections, while the routine controls are done by the owner of the hives (beekeeper), who will report any alteration to him.

Link to the local monitoring networks

It is expected that the national monitoring network APENET could link to local (regional, provincial) monitoring networks previously established or in progress with the aims to contribute to the knowledge of bee health status.

Dedicate software

The person in charge of each module will input the information obtained in a real-time database available on the web (**www.izsvenezie.it\apenet**).

Summary of the activities

Modules: 20 distributed on the national territory;
Number of apiaries per module: 5 located in an area of about 50 km radius;
Number of hives per apiary: 10;
Standard inspection of the modules: 4 times a year (after winter; in spring; in summer; before wintering).

Data recording per hive

1. Strength of the colony (number of adult bees, amount of brood (capped and uncapped), drone and worker bees), food storage (pollen, honey), queen age, drone availability;
2. Recording of data on the colony (mortality, flying activity, presence of pollen, disease symptoms, beekeeping practices and medicinal treatments);
3. Pollen sampling, and dead bees if available (chemical analysis);
4. Live bee sampling (virus, nosema).

Environment recording

1. Orography (plain, hill, mountain);
2. Prevalent use of the territory (agriculture, wood, industry, inhabited area);
3. Main cultures;
4. Meteorological data (temperature, rain, etc.).

Conclusions

The costs for the creation of a national monitoring network are related to its activation, functioning and maintenance, laboratory investigations, overheads. These costs account to less than 0.2% of the annual losses caused to agriculture by the loss of pollination, i.e. 250 million euros (Porrini, 2008). The information collected through the APENET monitoring network will provide a broad database from which to explore patterns of disease, toxic exposure and management practices that may be linked to the occurrence of honey bee mortality and colony losses. APENET aims at providing an accurate assessment of the overall health condition of honey bees at the national level.

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STALKING THE GIANT ASIAN HONEY BEE IN CAMBODIA

by THOMAS M. STOCKWELL

Attacked

The Javanese fears not only the sting of the Apis dorsata, but also its disposition to follow its disturber These bees angrily pursue in great numbers and to great distances the person who disturbs them in their habitation; and in such cases running back and forth or hiding in thick bushes helps little, for the insects, with certain flight are close upon their heels. [1] *(1876)*

We were squatted in the high brush when they attacked, the bees shooting off the huge comb straight at us. We were no more than a few feet away. It was a colony of *Apis dorsata*—the Giant Asian Honey Bee. We didn't have any protective gear on us: no bee suits, veils or gloves, and the bees were intent on chasing us away.

Dani Jump, our guide, had earlier asked us "Do you know about the Mexican Wave?" He had explained how *A. dorsata* signaled its warnings: "One bee will sense your presence, and send out a pheromone that telegraphs the danger. Then it will flash its wings. The others sense the danger, and the whole message travels in a flash of wings across the comb. That's the Mexican Wave."

We were squatted in the high brush when the bees attacked.

So what do we do, we'd asked.

"Well, if you see the Mexican Wave one time, get very still and don't make a sound. If you see it twice, get down as low as you can."

And if we see it three times?

"Just run! Don't look back! They'll chase you for a long time. Just run!"

One, two, three times the wave had flashed – a psychedelic display of orange and black — and now they were at us!

But there was no place to run. The logged-over Cambodian jungle was shoulder-high in brush and a tangle of grasses and weeds and branches. Our only protection was the cloud of smoke that our honey hunter guide was wafting over us – a cloud from a bouquet of grasses that he carried in his hands, wrapped in thick green leaves. And he was laughing hysterically in that high-pitched laugh that some Cambodians let out when something has gone seriously wrong: "Hee hee hee!"

So we sat there, surrounded, letting go of the fear – something that every beekeeper learns through experience: a sort of Zen moment of realization that whatever is going to happen **will** happen. The bees streaked and buzzed and pelted us, but after about five minutes of concerted attack, they returned to their comb, seemingly content that their danger had passed. Only one of us had been stung; ironically, the native honey hunter. We gingerly retreated back to the main path in the brush.

A close call? Most beekeepers will tell you that bees won't attack without reason—because of noise, or weather changes, or a recent disturbance — but this attack seemed without logic. We had been about five feet away, calm, and exceptionally quiet. Maybe something else was in the bush with us that we couldn't see.

Later I asked Dani Jump, "Should we be concerned about land mines?" The tangle of forest was all about our feet, and we'd already learned that the only safe place to walk in Cambodia was on well-trodden pathways.

"No, I don't worry about land mines," he replied casually. "It's the cobras I worry about!" A sobering thought, considering where we were currently walking.

A Journey Begins

As far back as 1878 AI Root offered $100 for a single colony delivered to him but none succeeded in obtaining the prize... [2] *(1899)*

For Judith and me, this first encounter was the culmination of a year-long interest in *A. dorsata*. The previous year we'd been wandering through the Khmer temple of Praeh Kahn near Angkor Wat when we'd stumbled upon a slab of wax comb lying on a block of purple sandstone. The comb, about an inch thick, was a nearly perfect triangle of deep yellowish brown, with large hexagonal cells that were expertly cleaned of all debris. It looked as though it had been manufactured in some gigantic wax press, and in the setting of the ruins of the Angkor temples – where the massive roots of strangler figs snaked down from Tualang trees that grew directly atop the sandstone walls — it seemed like one more mystery of Angkor. Did the giants that built these temples also have giant bees? The sheet was the largest single comb I'd ever seen, and I'd snapped a photo because I couldn't imagine the colony that had constructed it.

Almost a year passed when I stumbled upon the photo again and began my search for answers to the questions it had raised.

Who could identify the bees that made the comb? What did they look like? Did they make a honey, and if so, how did it taste? It was the beginning of a search that ended in an adventure, and revealed a whole new variety of beekeeper: the native honey hunters of Cambodia.

The slab of dorsata comb that sparked our interest.

The Reluctant Beekeeper and the Bee-Widow

A little of my personal background in beekeeping is probably in order. I initially became involved in beekeeping nearly 40 years ago in Northern Indiana when I bid at auction on my neighbor's equipment. My bid had nothing to do with bees, but was merely a gesture of compassion for a neighbor who was being forced by ill-health to give up his farm.

My token bid of ten dollars netted me with a wagon-load of equipment, but fortunately, I thought, it did not include a single colony, for I had no intention of becoming a beekeeper.

Yet, somehow, news spread, and it wasn't long before my wife Judith was fielding telephone calls about swarms that needed to be removed, bee trees that had been spotted, and houses that were infested. Meanwhile, while I gallivanted after wild bees, she was caring for our new born baby, and in my absence started telling people she had become a "bee-widow". Eventually, we moved to start our individual careers, and the bees were left behind. I never thought I would miss them.

In fact, over the years I learned to hide my interest in bees, relying on Judith to offer up my unusual experiences to friends in need of help. Of course, I'd occasionally assist neighbors in moving their colonies, or in setting up new hive stands, and this sometimes led to a visit of a professionally kept apiary. However, I assiduously avoided raising bees myself. The moniker of "Bee-widow" stung too much.

But last Spring Judith said *she* wanted to raise bees, and so – after thorough negotiations about whose bees these were to be (hers!) — we ordered up a swarm of Russian-"Yugo" Carniolan hybrids from Honey Bee Genetics in nearby Vacaville, CA.

Then I stumbled upon that mystery photo of the wax comb, and my craziness began again. I had to find out what had made it.

The Giant Honey Bee, Apis dorsata

Of these bees — long a sort of a myth to the bee keepers of America and Europe — strange stories have been told. It has been stated that they build their combs horizontally, after the manner of paper-making wasps; that they are so given to wandering as to make it impossible to keep them in hives, and that their ferocity renders them objects greatly to be dreaded. [3]*(1899)*

As I began my search to discover more about the comb, it was soon readily apparent that it was from *Apis dorsata dorsata*, the Asian Giant Honey Bee: there were numerous photos and videos on the Internet, and scores of references in books about bees. But the historical references written before the turn of the 20th Century were, in themselves, mysterious. Was it true that there had been a concerted effort to import these bees into the United States? And if so, what had appened to them? And, to set the record straight, how big were these bees in actuality; how vicious; and how productive?

Moreover, I was curious about the honey: What did it taste like? What blossoms did it come from? What were its properties?

And finally, how did native Cambodians themselves relate to this bee? Were they, as some old articles suggested, timid and afraid of them? Or were the bees and their products considered to be a part of their economy? Was there actually a form of commerce of wild bee honey in the markets and at the road-side stands that we had seen on our visit?

I had to find out, and when the opportunity to return to Cambodia became apparent, I began contacting friends and family members in the Siem Reap area, hoping to find someone who could answer these questions. Everyone I contacted said, "You need to get in touch with Dani Jump!"

Dani Jump and Bees Unlimited

Dani Jump is an unconventional personality in an unconventional occupation. Even his appearance is controversial in Siem Reap: He wears his hair shoulder-length with a gray beard down his chest, making him look like he's just stepped forth from a monotype of 19th Century edition of *American Bee Journal*. Though he is an American citizen, and served three tours in the Peace Corps, he's spent little time in the States, and – despite his years with wild bees around the world – says he's never handled the domesticated European strains of the honey bee, *Apis mellifera*.

From 2003 to 2008, Dani was the advisor for the Angkor Center for Conservation of Biodiversity (ACCB) creating a comprehensive beekeeping and sustainable honey harvesting program for Cambodians. The bee project, one of the first of its kind in Cambodia, was mainly funded by the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ).

The project was designed to promote and disseminate instruction on appropriate technology beekeeping with the Asian Hive Honey Bee (*Apis cerana*), "rafter" beekeeping with the Giant Asian Honey Bee (*A. dorsata*), sustainable honey harvesting involving all local honey bee species, and adequate honey and wax processing, as well as quality control and marketing of the products. This bee program worked solely with local stocks of native bees.

In 2008 he left ACCB to start his own organization Bees Unlimited (**www.beesunlimited.com**), offering training in sustainable honey harvesting of native bees, and educational opportunities. Bees Unlimited had also just begun to give unique tours of native bees, including *A. dorsata* (Giant), *A. cerana* (hive), *Apis florea* (dwarf), and *Trigona* (stingless).

Judith and I arrived in Siem Reap after contacting Dani through email. And, with a slight sense of "anything goes", we set out in a Tuc-Tuc with Dani to the Bantay Srie area northeast of Siem Reap.

Dani Jump was our guide. He is the advisor for the Ankor Center for Conservation of Biodiversity, creating a comprehensive beekeeping and sustainable honey harvesting program for Cambodians.

Raftering

There were six of us now in the brush: Dani Jump, Judith, our Tuc-Tuc driver, and our Cambodian honey hunter with his son. The son was out ahead of us, locating colonies under the canopies of brush and calling to his father. When he found a colony, he'd whistle and we'd wade across through the undergrowth. In this manner, we eventually made our way to seven or eight colonies, crouching down and creeping slowly until we were three or four feet away.

Each colony was nesting on a "rafter": A limb cut and propped laterally between saplings, under the shade, about five feet above the ground. Because so much of the forest had been cut down, raftering is seen by many as the mechanism by which these bees can survive deforestation. Before deforestation, these bees made their combs high in Tualang trees, 100 or more feet above the ground.

But raftering also creates problems: We had to be careful not to be in the flight path of the bees, because there were hundreds zooming in and out of the brush, and since they are aggressively defensive, one can easily imagine the dangers to casual hikers in the brush. And because the bees are migratory – following the nectar flow as the season progresses – they sometimes end up nesting in the high ceilings of the Angkor temples, making them pests to tourists.

At first it was difficult to see each raftered colony, but after our eyes adjusted, we oriented ourselves for closer inspection. Even after our near catastrophe with the first colony, we still didn't bother with veils or gloves, but were kept in relative safety with the smell of smoke about us. Perhaps it was the heat and humidity—combined with a heady sense of invulnerability — that had deadened our sense of danger.

Hanging Out with Giants

The colonies were quite large, with thousands of bees hanging across 2 foot and 3 foot wide combs. Yet, despite their reputation, each bee itself was not much larger than an *Apis mellifera* queen: Approximately an inch in length.

The bees hung from the rafter itself in a layered curtain over the comb, each bee clinging onto the back of another. Foraging bees seemed to enter the colony at the bottom of the comb, alighting at the triangular tip, and crawling under the curtain. Studies have estimated that as much as 95% of the bees of a colony is deployed within the curtain structure, offering protection from the elements, ventilating the colony, and standing watch against threats.[4] They were quiescent, beautifully striped with orange and black with cloudy golden translucent wings. With their large stingers sticking out, it was like looking at the back of a brightly colored hedgehog bristling on a limb.

The Honey Head

Because the workers completely covered the colonies, we had no view of their stores of honey or brood. Besides, we had only wanted to see the bees, and didn't want to attempt harvesting. Considering that we were here in November – after the rains – Dani Jump said there probably wouldn't be much to harvest anyway. Jump said that the honey of *A. dorsata* was normally stored in the upper corners of the colony, usually on one side, in a separate area that he termed the *honey head*.

Honey Brokers and Mead in Cambodia

In Cambodia, as in other Southeast Asian countries, the traditional honey hunter takes the entire comb, complete with brood and honey stores, and sells it to a middleman who brokers it to the small road-side markets.[5] The honey isn't always separated from the wax, and sometimes pieces are merely stuffed into plastic recycled water bottles, along with wings and legs and bodies as a sign of authenticity. We had seen such bottles at road-side stands, looking like brown or black oil. Such was the quality of the native packaging that we witnessed in our travels.

Meanwhile, the brood is, itself, considered a delicacy, sometimes folded up and fried up in oil and served with rice, and sometimes eaten raw. I later learned that my son experienced this delicacy at a small Khmer restaurant, but he indicated that it must be an acquired taste.

Some brokers accumulate the honey they receive and allow it to ferment with natural, air-borne wild yeasts. They then sell this as a kind of high-proof mead at the same road-side stands. Later that same day, Dani Jump took me to a home where one of these mead-making enterprises was in process. The inside of the home itself, high on stilts beside the Siem Reap River, was immaculate, with mats rolled neatly against the wall and the floor newly swept.

However, when we were led into a side

Each colony was nesting on a "rafter": a limb out and propped laterally between saplings, under the shade, about five feet above the ground.

The colonies were quite large, with thousands of bees hanging across 2 foot and 3 foot wide combs.

Some brokers accumulate the honey they receive and allow it to ferment with natural, airborne wild yeasts.

"Honey head," an area of surplus honey normally stored in the upper corners of the dorsata colonies as shown in this picture *(Photo by Dani Jump)*

closet where the mead was fermenting, any semblance of housekeeping was clearly missing: The floor was sticky with the thin honey and dead bee bodies, and the smell of fermentation was redolent. Several old plastic garbage cans were warehoused here, representing multiple years of accumulation. The owner told us he bought the honey from honey hunters out of the flooded forest of the Tonle' Sap lake, south of Siem Reap, where they had harvested the colonies from the branches of trees standing in boats. He showed us what was left from last year's harvest, and another can from five or more years before. Upon lifting the lids, the stench nearly knocked me over: The discolored froth from fermentation was still laced with wings, legs, and desiccated bee bodies.

Counterfeit A. Dorsata Honey

A. dorsata honey generally has a higher moisture content than the honey from *Apis mellifera*: Greater than 21% vs. 17.5%.[6] This makes the honey seem like more a thin syrup than the typical Western idea of a honey. The total sugar content is also less: Between 30-40%, and the unfermented aroma is very delicate. In the higher quality restaurants around Siem Reap where Dani Jump's past packaging efforts can be witnessed, a processed and decoratively packaged version is often served with yogurt. But seldom is it served with tea. We saw this packaging only in the best restaurants, as the cost of this processed honey is about $10 USD/Liter, and is well beyond the budget of most Cambodians who struggle on less than a dollar a day.[7]

It's the qualities of *A. dorsata* honey (high moisture, lower sugars) that have inspired some enterprising native honey brokers to make counterfeit dorsata honey, using brown sugar and water, adding a few bee legs and wings to the concoction to create the aura of authenticity. This was a hot topic of conversation between Dani Jump and this particular honey broker, who was considering this avenue of commerce because of decreasing supplies of real honey. When asked how he made it, he refused to share his knowledge for fear we might take up the practice in competition.

Economic Challenges of Sustainable Harvesting

These insights about the *honey value chain* of *A. dorsata* products in Cambodia made me realize how important Dani Jump's efforts for sustainability had become: With the forest habitat of *A. dorsata* being rapidly degraded by logging, merely setting up rafters can not save these bees. A whole new method of harvesting needs to be propagated: Instead of taking the entire colony, honey hunters should be encouraged to take only the *honey head* from the comb, leaving the brood for the next generation of bees. But it's a long road to native understanding for a number of reasons.

First, because brood actually sells at a greater premium domestically than the honey, the economic argument often falls on deaf ears. Secondly, the opportunistic nature of traditional honey hunting in Cambodia is actually a reflection of the bees' migratory practices as they follow the nectar flows and move between well-established nests. With their bee trees gone, they are forced closer to the ground, which makes them easier to rob. Thirdly, as the number of *A. dorsata* colonies decrease, the value of its honey and brood increases as the local demand rises. Finally, there is no single governmental agency in Cambodia that is concerned with the bees, and those that have some jurisdiction are the same agencies that are supporting the deforestation of the habitat.

Heritage of the Honey Hunters

In this context, Dani Jump's mission – to build the practice of sustainable honey harvesting – seems monumental (if not futile). And yet, he is making progress.

As we trudged back towards the main dirt road, we could see the low Kulen plateau in the distance, still hidden by a towering jungle. Phnom Kulen is the sacred mountain site where King Jayavarman II proclaimed his peoples' independence from Java in AD 802. It is still considered sacred today by the modern Khmer people. It's a place where the Siem Reap wells up out of clear sandy springs and then tumbles through sandstone gorges, over prehistoric carved lingas, down breath-taking waterfalls, to make its way through the ancient waterworks of Angkor kingdom to the Tonle' Sap. It is still a place where the jungle rules the lives of those who live within it, providing food and shelter.

It is also the place where *A. dorsata* colonies still hang from cliffs at the beginning of their long seasonal migration; migrations that were following the nectar flow thousands of years before humans set foot in the jungles of South East Asia.

Now, in the heat and the humidity, the dense brush through which we had been treading for the last two hours looked denuded, crippled, and confounded. All that we had seen of the real jungle were the remnants and scrub growth of logged forest; its trees had been harvested for charcoal to fire the bricks that filled the walls of the new concrete buildings and homes of the modern Siem Reap city.

A lone, dying Tualong tree that stood more than 120 feet. Dorsata colonies hung high in its branches.

We came across a lone, dying Tualong tree beside the path. It stood more than 120 feet, its first branches opening up ninety feet above our head. It had been left by the loggers, probably because it was too encased by the roots of the strangler fig that was slowly chocking it to death. Our honey hunter and his son stooped and squatted by this tree to rest, to smoke cigarettes, and to gaze upwards. There, in the high branches, were several more colonies of *A. dorsata* hanging beneath the limbs – so distant from the ground that I could barely make them out.

"He used to climb trees like that," Dani Jump told us. "To get to those bees. One bee tree of that size might have housed 20 or 30 colonies. Maybe more! But they're gone now." It was a moment of sobering realization, that in two hours of traipsing through thickets and brush, we had only come across eight colonies on rafters. There were certainly hundreds more hidden in the brush, but their protection from opportunists who would rob their honey and brood seemed meager. Imagine, I thought, 20 or 30 such colonies in a single tree, and thousands of trees stretching back to the distant plateau, high above.

As the honey hunter conversed with Dani Jump, his son stood listening to every word spoken in Khmer. There was a sense that a tradition was being passed between the generations; that here stood the old way to get the honey; spotting the colonies; climbing the Tualang; cutting the combs; and lowering the entire mass of wax – brood and honey together – in baskets to the ground. The new way, using rafters, was easier, and leaving the brood behind was better.

And maybe, after the forest regenerated itself in 50 or 100 years, the Giant Asian Honey Bee might yet return to the tall canopy where it belonged. It was a thought worth contemplating.

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Fireweed – A Premier (but fickle) Honey Plant

by STEPHEN PETERSEN[1] and DR. VAUGHN M. BRYANT[2]

Brian Winston stands in a field of fireweed previously cleared for agriculture near Delta Junction, AK; fireweed is a rapid colonizer of disturbed ground. (Photo by Don Winston).

Introduction

Alaska suffers forest fires every year, primarily caused by lightning strikes. Here in Alaska's Interior during June and July the 20 hour sunshine is frequently reduced to seeing a large red orb circulating above our heads. During a few weeks almost every summer, light is barely able to penetrate the choking pall of smoke from fires near Fairbanks. The California wildfires that make the prime-time news desks pale in size comparison with "normal" fires in Alaska; albeit the property damage and death toll are much more significant down south. Like everything else in Alaska, fires are *big*. Here's a short fire history (Statistics courtesy of Alaska Fire Service):

- 2004 – 10,091 square miles burn Statewide; an area larger than the State of Vermont. In Fairbanks the "Boundary" fire, 20 miles from town, burns 840 square miles; half the size of Rhode Island. This was the largest burn season in Alaska since 1956.
- 2005 – 7,263 square miles burn Statewide; an area half the size of Connecticut and New Jersey combined, and the third largest area to burn since 1956.
- 2006 – 416 square miles burn Statewide
- 2007 – 1014 square miles burn Statewide; excellent honey production 120 lbs/colony.
- 2008 – Only 162 square miles burn Statewide; beekeepers remember a wet summer when my 15 colonies averaged only 18.5 pounds per colony.
- 2009 – 4,584 square miles burn; an area half the size of New Hampshire- an excellent honey year with averages in the Interior from 100-145 lbs per colony.

I remember the summer of 2004 - small planes were grounded in Fairbanks because of poor visibility, smoke alarms were going off, and the air quality monitors on the roof of the State building downtown measured 1000 micrograms per cubic meter ($\mu g/m^3$); more than three times the EPA value of 300 ($\mu g/m^3$) that is considered hazardous. In 2004 the two most polluted cities in the world, ranked by the World Bank, were Cairo (169 $\mu g/m^3$) and Delhi (150 $\mu g/m^3$) - in all fairness these numbers were a yearly average, while the readings in Fairbanks were for a few summer months only. Fairbanks residents wore white particle masks, my bees stayed at home – flight activity was severely curtailed, and I escaped to SE Alaska on a kayak trip where even there they had a record fire year. Amidst all the smoke deep down I had a secret smile - for beekeepers forest fires mean the regeneration of the environment and that means fireweed - one of the first colonizers of a disturbed area.

The distribution of fireweed (*Chamerion angustifolium*) in North America (Oregon should be included as well as Idaho). Map courtesy of USDA, NRCS. 2009. The PLANTS Database (http://plants.usda.gov, accessed 23 October 2009). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

A foraging honey bee approaches a fireweed blossom.

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Close up the fireweed flower – pollen can be seen on the tips of the anthers.

Names and Places

Fireweed is a common plant with circumpolar distribution. Sometimes growing to more than six feet tall, it is frequently found in disturbed areas. It is not limited to higher latitudes, but is also common in the Pacific Northwest in disturbed areas, e.g.; logged areas, forest fire burns, and the areas surrounding Mt. St. Helens after the 1980 eruption. It is a common and important honey plant in Canada, Russia (especially Siberia) and other northern countries. Its newest Latin binomial (scientific name) is *Chamerion angustifolium*; it's a member of the Evening Primrose Family (Onagraceae) which also includes fuchsias (originally from South America). Latin synonyms include – *Epilobium angustifolium* (the "old" name), *Chamaenerion angustifolium* (popular in older English publications), and *Epilobium spicatum*; I'll let the plant taxonomists battle out the names. Latin names are supposed to clear up any misconceptions that may arise from using common names; for example fireweed is also the common name for a weedy composite *Erechtites heiracifolia*. Here are some common "common" names used for fireweed around the world:

- American English- fireweed
- British English – rosebay willow herb
- French – epilobe
- German – schmalblättriges
- Norwegian- geitrans
- Russian – Иван-чай (*Ivan-chai*; literally Ivan's tea)
- Romanian- zburătoare
- Spanish - epilobio

Fireweed as a Honey Plant

All of the literature I've reviewed plus my personal experience leads me to state that fireweed cannot be relied upon as a sure source of surplus honey every year. Fireweed flows have been described as: "*the 10 year average yield is likely to be a disappointing figure, since the nectar flow is not dependable from year to year*" (Arant 1935 in Pellett - revised 1976); *a major source of fine quality honey, but produces irregularly* (Burgett *et al.* 1989*); heaviest yields are likely in the first few years following a forest fire and before the plants are crowded out by other more competitive pioneer species* (Prov. of British Columbia 1938, in Ramsay 1987); in Eva Crane's "*Directory of Important World Honey Sources*" (Crane *et al.* 1984) she gives nectar ratings from N1 (a major source of surplus honey - 12 references), through N2 (a medium source of surplus honey – 8 references), to N3 (a minor source of surplus honey – 1 reference).

The plant yields nectar best during conditions of warm, still air – optimum temperatures are between 70° - 80° F (23-25°C) with a relative humidity of 60-70%; these conditions are frequently met during summers in Alaska's Interior.

As a pioneer plant it appears that the farther north it is found, the longer it remains a dominant pioneer species. F. W. Sladen notes that at a location 100 miles north of Ottawa, the fireweed was practically exhausted six years after the fire that produced it; but over 100 miles further north local residents observed a fair amount of fireweed flowering 15 years after the burn (Sladen 1921). Some rather respectable yields are noted as originating from fireweed; W. H. Turnbell (near Westminster, B.C.) writes that his two best colonies yielded 550 pounds each; a scale colony in Quebec gained over 20 pounds a day in mid-August, and the average annual yield for 6 years was 144 pounds per colony; 100 pounds of which was probably from fireweed (Sladen 1921).

Native Americans (as well as contemporary "survivalists") use the young shoots in salads as it is very high in vitamins A and C. In Canada, England and Russia fireweed is frequently used to make tea (Johnson *et al.* 1995) - probably giving rise to the Russian common name of Иван-чай (*Ivan-chai*); literally Ivan's tea.

As can be seen by the close up photographs, the four pink petals composing the floret are found growing in long clusters at the stem tips. They are sometimes white in color (rarely). The anthers (male parts of the plant where pollen is produced) are some distance away from the nectaries located at the base of the style, yet close to the stigma (the tip of the female portion of the flower where the pollen needs to land to produce seed). Coupled with the fact that the flowers are more or less "horizontal" in aspect this means that fewer pollen grains are going to "fall" into the base of the flower causing the mixing of pollen in the nectar. This is but one of the reasons why fireweed pollen is "under-represented" in fireweed honey (see following discussion of fireweed pollen in honey). The nectar secreted by fireweed flowers has been measured between 1.06 and 2.90 milligrams per flower per day (Crane *et al.* 1984), with maximum secretion between 18:00 and 06:00 (Ibid) - a time of flight for honey bees in Alaska's long summer days.

A rare white variety of fireweed along Farmer's Loop Road in Fairbanks, AK.

In mid to late August the seed pods mature and split open releasing thousands of wind-borne seeds. According to the USDA plant data base there are 6,500,000 seeds to the pound.

Delta Junction, AK 1991 (212 grains counted 2,788 grains/10 grams)

Pollen type	(1) Relative Pollen %	(2) Pollen Coefficient Value	(3) Relative Quantity	(4) Adjusted Percentage
Apiaceae (a)	00.6	50.0	00.012	00.5
Brassica sp (b)	62.8	150.0	00.419	01.9
Epilobium sp (c)	06.3	0.3	21.000	**95.9**
Melilotus sp (d)	28.3	75.0	00.377	01.7
Taraxcum sp (e)	00.6	10.0	00.060	00.27
Other minor types (f)	01.4	50.0	00.028	00.128
Total	100%		21.896	100%

Notes: The pollen concentration of 2,788 grains/10 grams is typical of a good fireweed honey (a low value adds credence to the unifloral designation as fireweed honey).

(1) The number of pollen grains counted in this sample and then expressed as a relative percentage in a honey sample of 10 grams (212).

(2) A corrective value established by melissopalynologists to convert the relative pollen percentages counted into the actual importance of each nectar source. This corrective value is determined by: (column1 ÷ column 2 = column 3). A value of 50 has been assigned to pollen from "miscellaneous nectar sources" for which no coefficient value has yet been determined (Sawyer 1981)

(3) The quotient of column 1 divided by column 2.

(4) The percentage resulting from relative quantity (3) divided by the total in that column (e.g. 21.896)

(a) Apiaceae (previously known as the Umbelliferae family) - my guess is that it may be Cow parsnip (*Heracleum lanatum*) common in Alaska but unknown as bee forage.

(b) Canola or rapeseed

(c) Fireweed (genus *Chamerion angustifolium,* in Europe but *Epilobium angustifolium* in AK)

(d) Sweet clover (yellow or white)

(e) Dandelion

(f) Pollen corrective values have not been determined for all of the nectar producing plants. For those, for which values have not yet been established, an average corrective value of "50" is used.

After fertilization seed pods develop and, by mid to late September, they split open releasing thousands of tiny seed capsules attached to a white gossamer float. These are able to be carried by the wind for great distances (an important factor for pioneering plants). The plant is also spread by underground rhizomes (a rhizome is a horizontal stem of a plant that is usually found underground that may give rise to above-ground stalks – we eat the rhizomes of ginger). Plowing or roto-tilling a field of fireweed breaks up the rhizomes and most of the pieces are capable of producing a new plant.

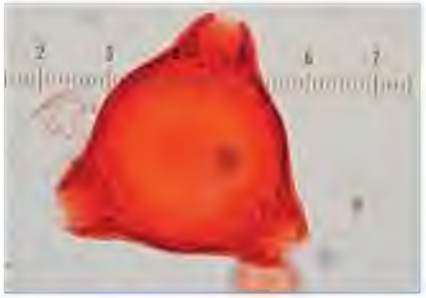
Fireweed Pollen

Perhaps the most striking thing about fireweed pollen is its color; a dark or navy blue to perhaps purple pollen showing up in pollen traps in early July through mid-August is a sure sign your bees are doing some foraging on fireweed. Looking at the anthers in the field, it is hard to see the blue-to-purple color but the color, is unmistakable when it shows up in the pollen traps.

Seen under the microscope fireweed pollen is spherical-triangular shaped and fairly large (by pollen standards) averaging, according to Moriya (1976) 90 µm (1µm = 1/1000 millimeter). In the photographs accompanying this article the pollen grains are on the order of 90 to 100 µm. Characteristic are the three to four prominent lobes described by melissopalynologists (experts on pollen in honey) as *triporate*, *tetraporate* or *stephanoporate* (having 4-5 protruding pores - see accompanying photographs).

The size and shape of fireweed pollen is another factor in why it is under-represented in honey samples. As a bee forages she is constantly removing pollen grains from her honey stomach by means of the proventriculus which is similar to a sphincter muscle in the human stomach. The function of the proventriculus is to open and close and remove large debris from the consumed nectar. It does this by forcing the nectar back and forth through the opening, which does not completely close. That action traps most large pollen grains but the smaller ones, such as the pollen of clover and canola, are rarely removed.

(l) Interior Alaska can produce a whole spectrum of honey colors, but is well known for its extra water white fireweed honey (far left). (r) A perfect frame of light fireweed honey ready for uncapping and extracting.



A triporate (3 lobed) grain of fireweed pollen approximately 92 microns across. The red color is due to staining in the microscopic preparation process. Each tic mark is 2.5µ; 25µ between numbers on the scale. Photo courtesy of Dr. Vaughn M. Bryant, Texas A&M University Palynology Lab.

Spreading forest fire in Interior Alaska; fireweed grows quickly on burned out land (Photo courtesy of Alaska Fire Service- AFS).

Fireweed Pollen Found in Honey

Melissopalynology is the study of pollen in honey; most European importers require some sort of pollen identification to confirm geographical origin and the floral components purported to be the source of honey so the consumer may be confident in their purchase. There are no such regulations in the United States- as a result domestic honey is frequently "mislabeled" (perhaps through no intention on the producer/packers part) as to its true floral source. After examining more than 1,100 samples of American honey, it was found that more than 60% of the time the floral sources identified by the producers or beekeepers were incorrect (Bryant & Jones 2001).

Because of several factors previously mentioned about the nectar sources (e.g., floral structure, amount of pollen produced, size and shape of pollen grains), the ability of bees to eliminate collected pollen from their honey stomachs during the return flight from flower to hive, and how the honey is later processed (e.g., the amount of pollen in the extracting combs, whether the honey is squeezed or not) some pollen types, especially fireweed pollen, is always highly "under-represented" in a given sample of honey. To give a few examples of the pollen counts found in common bee forage plants; a typical honey made exclusively from white sweet clover (*Melilotus alba*) or canola (*Brassica napus*) nectar should contain an average of about 72,000 grains per 10 gram sample; a sample of pure dandelion (*Taraxacum officinale*) or pure apple nectar (*Malus domestica*) 18,000 grains/10 grams; but honey from pure fireweed (*Chamerion angustifolium* or *Epilobium angustifolium*) and white acacia (*Robinia pseudoacacia*) nectar are at the low end of the spectrum with only an average of 1,125 grains/10 grams of honey(Bryant & Jones 2001).

If one were to simply count and identify 200-300 pollen grains (the standard number for most honey analyses) in a sample and express it as a simple percentage, there would be frequent errors in labeling the honey. This is why it is important to use "pollen coefficients" – a factor by which the relative percentages of pollen in a honey sample are multiplied or divided to provide a clearer and more nearly accurate picture of the true foraging spectrum of the bees. As an example, shown in the table are several pollen spectra, as reported by Bryant and Jones (2001) from a honey produced in Delta Junction, AK.

***Caveat emptor* (Let the Buyer Beware)**

Buying true fireweed honey off the grocery store shelf is a risky proposition- just because the label says "fireweed honey" or it is from Alaska does not make it so. Our local newspaper even published a recipe in the Food Section detailing how to make "Fireweed Honey" by boiling clover and fireweed blossoms in sugar syrup; our cries that it was "not honey, only bees can make honey" and that it should be called syrup fell on deaf ears. Available on the Internet are sites promoting this man-made sweet concoction claiming "we guarantee you can't tell it from the real thing" or touting such questionable claims as "our Alaskan beekeepers have perfected their own methodology of separating the bees to create a "pure" fireweed honey" (*I'd sure like to learn their methods*!); or, midway through the honey spectrum "fireweed blossoms steeped in natural golden honey to create the delicate flavor of this Alaskan favorite."

How does one tell if they're buying "true fireweed honey"? Difficult yes, very difficult; more States should pass labeling laws as Florida recently did.

A legal definition for honey in Alaska would take the syrups and "blossom steeped" products off the shelf as "honey" but how does one deal with the 100% fireweed honey claims? An analysis of the pollen spectrum by a qualified melissopalynologist is currently the only certifiable method; there are "indicators" such as taste, color and smell, but these organoleptic properties are somewhat subjective. Fireweed honey producers should be willing to back up their claims or otherwise sell their product as a "wildflower" honey. *Ego apis ergo sum.*

Acknowledgments

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Soybean, A Good Honey Plant–Sometimes

Soybean, soya

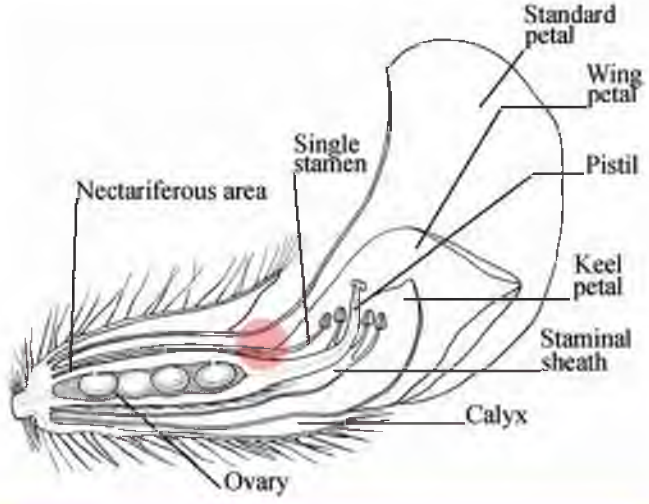
Scientific name: *Glycine max*

Synonyms: *Dolichos soja, Glycine gracilis, Glycine hispida, Glycine soja, Glycine ussuriensis, Phaseolus max, Soja hispida, Soja max*

Origin: *Glycine max* is known only from cultivation (a cultigen), but is apparently closely related to the wild *Glycine soja*. The genus *Glycine* has two major gene centers, one in eastern Africa and the other in Australasia[1], with a secondary center in China. While the origin of soybean is in dispute, it is generally thought to have originated in northeastern China.[8 &32] Some believe that it became domesticated during the Shang dynasty (ca.1500-1100 BC) or perhaps earlier[8].

Plant description: Because the soybean is of considerable agricultural importance, the species now exhibits much variation due to the activities of plant breeders. In nature the soybean probably was much branched, but modern cultivars often have fewer than six branches. The lower parts of the stem become woody with age. The stipulate[2] leaves are placed alternately on the stem and consist of three leaflets (trifoliate) that range in shape from broad and rounded (ovate) to longer, narrow and more pointed (lanceolate). Varieties with wavy leaflet edges (sinute) also exist.The leaf stem (petiole) is relatively long. Leaves are commonly dark green, but can be tinged with brown, red, or blue and are normally shed as the seed pods ripen.

Flowers are borne on short racemes[3] in the upper angle between the leaf petiole and the stem to which it is attached (axil). Floral groupings can contain up to 35 small typical pea-shaped white to mauve colored flowers. Frequently many of the flowers borne on very floriferous varieties abort without setting pods. The standard petal or banner petal is usually about 0.2 inches (ca. 5 mm) long. There are two narrow wing petals and two tightly clasped together, but not fused keel petals that are shorter than the wings. The sexual column consists of the pistil and nine fused stamens (staminal sheath) and one single dorsal stamen. The nectary surrounds the



A longitudinal section through the center of a soybean flower. The pink circle is the approximate area of the entrance to the tongue channel that allows the bee to probe the nectar production and storage area (nectariferous area). No distinct nectar cup as described by Erickson and Garment[6] (see drawing above) is shown in this figure.The standard petal, sometimes called the banner petal, contains the nectar guides (not shown here) that point to the opening of the tongue channel. Most commonly bees land facing the standard petal, and if they trip the keel petal by pressing downward on it, they will almost certainly pick up pollen from the then exposed anthers and assist in self-pollination. If they are carrying pollen from a previous floral visit, they may also provide cross-pollination. Adapted from McGregor[17].

[1] **Australasia: A variously defined area in and around Australia and New Zealand.**
[2] **Stipulate: Having stipules—A pair of small leaf-like structures at the base of the leaf stem of some plant species.**
[3] **Raceme: a flower grouping where the individual floral stems (pedicels) come off of a central stem and the flowers bloom from the bottom of the grouping upwards.**

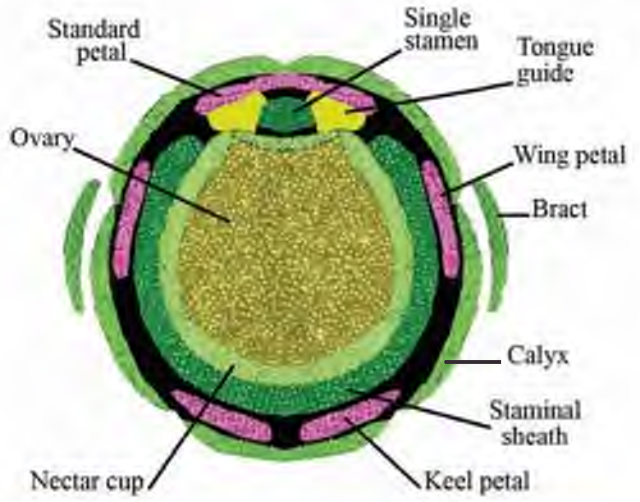


Illustration of a cross section through the soybean flower in the nectariferous area, which according to Erickson and Garment[6] is a cuplike structure (nectar cup) that is about 0.63 mm to 0.73 mm (ca. 0.025 inches to 0.029 inches) in diameter. These researchers found the openings through which nectar is secreted (stomata) to be concentrated on the rim and upper interior surface of the cup near the tongue guides, which they refer to as "slits". Adapted from Erickson and Garment[6].

ovary that usually contains 3-5 ovules and is in turn surrounded by the staminal sheath. The standard petal of mauve colored flowers have distinctive, more deeply purple-colored nectar guides that converge just above a tongue channel, which is located at the base of the standard petal and leads to the nectary. Within the tongue channel there are two tongue guides, one on either side of the single stamen, that guide the pollinator's tongue into the nectary area. While the white flowered plants have no purple nectar guides, Erickson and Garment[6] indicate that there are ultraviolet light reflecting patterns on both the white and mauve colored standard petals that probably also serve as nectar guides. In addition, the standard petal reflects ultraviolet light while the wing petals strongly absorb these wavelengths, and the two patterns together provide a strong contrast around the entrance to the tongue channel, and this may also serve as a kind of nectar guide.

At times the stamen filaments elongate, so that when the flowers open, the stamens are nearly as long as the pistil when the anthers begin to release their pollen. Sometimes the elongation is sufficient to push pollen from the end of the keel. At other times, the flowers don't open and self pollination occurs within the closed flower. The number of flowers within a floral grouping that open simultaneously depends on the soybean cultivar. An individual flower remains open for only a single day[6, 7, 17 & 32].

Distribution: Soybeans are grown mainly in the North Central States with a "tail of produc-

Left: A fully expanded mauve colored soybean blossom. Notice the deeper purple nectar guides on the large standard petal. The next largest petals are the wing petals and beneath them the very small keel which consists of two closely clasped together petals. It is seen best on the lower flower. In the top photo it curves upward and the then forward, becoming pointy in the process. Seeds provided by the soybean breeding program at Michigan State University. Middle: A fully expanded white soybean blossom. The standard petal is thought to have nectar guides that reflect ultraviolet light that the bee can see, but we can't. In between the two wing petals the attached end of the keel is visible. Seeds provided by the Nematology program at Michigan State University. Right: Two partly open white soybean blossoms. The front flower is partly open and the one behind it is much less open, still loosely rolled into a cylindrical sheath-like structure. Frequently soybeans remain closed and the pollen is shed within the unopened flower. When this happens, it leads to self-fertilization because the soybean is generally highly self-fertile. This is one of the problems encountered in the production of hybrid seed. Plants provided by the Nematology program at Michigan State University.

tion" that follows the Mississippi River south to about mid Louisiana (see reference no. 33). As of 2007, the states with the largest productions, in decreasing order, were IA, IL, MN, IN, OH, NE, SD, ND, AR[34]. Like many agricultural plants, soybeans generally don't persist in the wild[16] and would, therefore, not be expected to be found outside of cultivation in stands sufficiently large to be important in honey production.

Blooming period: Soybeans bloom in response to day length and temperature. The varieties grown in the US are divided into 13 maturity groups, each adapted to a narrow band between two latitudes that are only about 100 to 150 miles apart. The earliest maturity groups are adapted to northern Minnesota and southern Canada while the latest are adapted to southern Texas. The early varieties bloom when the days are relatively long and the nights are relatively short, whereas the later maturing groups bloom under relatively shorter days and longer nights. Planting a variety further north than the latitude to which it is adapted will extend the period of vegetative growth and delay flowering and the opposite occurs when a variety is planted further south than the latitudinal range to which it is adapted[4][35 & 36]. The beekeeping literature seems to suggest that soybeans grown outside of the latitude range for which they were developed are likely to be poorer honey producers than when grown within that range.

Ayers and Harman[1] report blooming dates that ranged from June to October. For the IL, IN, IA and MO area a respondent to the Ayers and Harman questionnaires indicated the blooming period there ranges from mid June to the end of July. Another respondent from AR indicated the blooming period in that state extended from late June to near the end of September, the range being so long because there were so many varieties grown within the state.

Importance as a honey plant: While soybeans have been known and cultivated in China for centuries, it was the work of Dr. W. J. Morse in the 1920s that is often given credit for creating a foothold for the crop in the US[32]. While the crop was known to produce oil for many years, soybean production didn't take off in the US until the 1930s, when it was realized that the soy cake, the byproduct of the oil extraction, could be used as an excellent, nutritious animal food supplement, and today the oil has become almost a byproduct of the large animal food industry[2 & 32]. As beekeepers, we even use it as a pollen supplement.

At first soybean was largely considered an unimportant honey plant. A. I. and E. R. Root in their 'ABC and XYZ of Bee Culture' (1920)[26], John Lovell (1926)[15] and Pammel and King writing about Iowa Bee forage (1930)[22] don't mention soybean. Soybean wasn't mentioned in the first edition of Frank Pellett's 'American Honey Plants' (1920)[23], but was mentioned in the second edition (1923)[24] where much of a page is devoted to the controversy about whether it does or does not provide a honey crop. As soybeans became more important, the beekeeping literature of the time seemed to be consumed by the topic of whether or not soybeans produced honey. There was no lack of proponents on both sides of the question. It turns out that apparently both sides were correct and the answer to the question is that sometimes it does and sometimes it doesn't produce honey. Today, what was once considered an unimportant honey plant is now known to have the potential for being a honey plant, even a pretty good honey plant. Oertel[20] (1939), from his questionnaires, found the species to be of at least some importance in IN, KS, KY, LA, NC, OH and TN. Ayers and Harman[1] (1992) found it to be of at least some importance in AL, AR, IA, IL, IN, KS, KY, MD, MO, MS, NC, ND, NE, OH, OK, SC, TN and VA and to be of considerable importance in the underlined states and to provide pollination opportunities in those in blue. There are times, however, when it appears to produce no honey (see Honey Potential below).

Honey potential: While soybean was once considered an unimportant honey plant, there were numerous reports of honey production from it. The following represents some of these reports, in roughly chronological order, as they appeared in the beekeeping literature. C. L. Sams[27] (1922), a North Carolina Beekeeping Extension Specialist, validated a North Carolina newspaper article by Dr. E. E. Pickham which claimed to have produced an average of 117 lbs of soybean honey per colony from 40 colonies. Alfred P. Johnson[11] (1944), located approximately 30 miles northeast of Urbana, IL, reported that one colony stored and capped a shallow super of soybean honey in five days; another stored 20 lbs in three days and others gained 5 to 7 lbs a day. Many colonies had gained 30 to 85 lbs at the time he submitted his short article, and because the honey flow was still in progress, he expected that some colonies would store 100 lbs. Pellett[25], essentially last edited in 1947, provides the following quote from J. R. Pinkham of Washington, NC (near the coast) who wrote to Pellett in 1922 and asserted,

> "A strong colony of Italians will store from 100 to 250 lbs in thirty or forty days, which about covers the blooming period of the plant. I had one colony which filled 175 sections this year."

Pellett also recounts a letter from J. E. Eckert[5], indicating bees near the coastal area east of Washington, NC had produced one to two supers of soybean honey when no other floral sources were available. Despite this information imparted by Pellett, he concluded, "There is little to indicate that the soybean is an important honey plant anywhere although it does at times yield some nectar." In 1952 Milum[19] recanted his 1940 belief [18] that soybeans produced no honey. This change of opinion was based on a honey flow at Urbana, IL that seemed to be very similar in both timing and weather conditions to that of the honey flow described above by Johnson.

Erickson (1984)[5], who has done much to provide an understanding of this honey production argument, states that beekeepers, particularly those in the central and southern US, have obtained yields of 150 to 200 lbs (ca. 70-90 kg) per colony. Free (1993)[7] reports, but without a reference, that a Russian study led to the calculation that one ha produces 150kg of nectar (134 lbs per acre). From the wording of Free's statement, I suspect that this figure was arrived at by estimating the average amount of nectar produced per flower and then multiplying this figure by the estimated number

Table 1. Summary results of the Severson and Erickson study[28] made on 17 soybean varieties.

Range of mean nectar volume (µl)[1]	0.022 to 0.127
Range of total nectar carbohydrate (µg/µl)[2]	301 to 1354
Range of total nectar carbohydrate /flower (µg/flower)	16 to 134
Range in relative glucose to fructose to sucrose values[3]	(1.0 to 1.2 to 1.4) to (1.0 to 1.2 to 6.7)
[1] µl: microliter =- one millionth of a liter.	
[2] µg/µl= microgram (one millionth of a gram)/ microliter	
[3] Glucose values standardized to 1.0 and other two values proportioned to that value	

[4] A diagram of day length at different times of the year for different latitudes can be found on the web[37].

[5] J. E. Eckert later became an important and influential apiculturist in the University of California system.

of flowers per ha.

Part of the early confusion about the value of soybeans as a honey source is explained by a careful study of soybean nectar production and nectar sugar contents done by Severson and Erickson[28] on 17 soybean varieties grown in Hayti, MO (extreme southeastern MO). In this study the planting dates for the different varieties were staggered so that they bloomed during nearly the same time period, and, therefore, were exposed to roughly the same environmental conditions during the flowering period. Nectar samples were taken four times during the day: (1) before 11.00 h, (2)between 11.00 and 12.45h, (3) between12.45 and 14.30 h, and (4) after 14.30 h. The flowers were not protected from pollinators, but there were few honey bees or other pollinators in the area. Table 1 provides summary results of this study that indicate how the different parameters of attractiveness to honey bees and honey productivity varied between the varieties. The authors conclude that while the major parameters of honey potential for the different varieties varied with time of day, for the most part, the differences presented in Table 1 were varietal and not environmentally dependent.

Honey potential is dependent upon a combination of: accessible amounts of nectar sugar/flower, the attractiveness of those sugars to honey bees, and the number of flower/unit area. The Severson and Erickson study clearly suggests that large differences in the amounts of nectar sugar/ flower exist between varieties. They also point out that the number of flowers /unit area for soybeans is frequently less than for other legumes. As an example, they compare soybean with 19.8 to 79.8 million flowers per acre (49 to 197 million flowers per ha) to alfalfa with 232 to 1350 million florets per acre (573 to 3,335 million florets per ha). Similar statements can also be made for the common trifoliate and sweet clovers. There might also be some differences in attractiveness among the soybean varieties based on nectar sugar compositions, though this parameter seems to me not as compelling as the other two[6]. Taking these three factors into account, the authors conclude, "Soybeans can become a very attractive nectar source when not blooming concurrently with these legumes..." In this study there was no consistent difference in nectar production between white and purple flowered varieties. Nectar was secreted between 9.00 h and 15.00 h [28]. During the day the nectar concentration tended to increase while the nectar volume decreased, which suggests that the nectar was becoming concentrated by evaporation.

Honey: Pellett [25] reports that a honey sample sent to him by the J. R. Pinkham mentioned above and purported to be soybean honey was light in color with a "peculiar but pleasing flavor." He further states that "the flavor is very distinctive and should command a ready market once the trade becomes accustomed to it." He found the honey to be "rather thin and light in body" and that it "granulated rather quickly, but would be graded as a high quality honey in most markets." Pellett also describes reports that he had received from different parts of the US. From Tyner, TN it was reported as very light in color; from Forest Glen, MD it was described as amber but slightly dark in color with a mild flavor. J. E. Eckert described the honey from the area east of Washington, NC mentioned above as light amber in color and of good flavor, but it granulated quickly.

Harvey Lovell in his 'Let's Talk about Honey Plants' series, cites personal correspondence from Macon, MS, that described soybean honey from that area as dark [12], but the correspondent admitted to having produced such a honey only once. A year later Lovell[13] describes a trip to Salisbury, MD (near the coast) where he encountered a very light honey that was very similar to that of lima bean. The local beekeepers claimed that it was soybean honey and that there were no lima beans being grown in the area[13]. In his 'Honey Plants Manual" [14] he describes the honey as "light amber with a medium body and a distinctive flavor generally described as good." J. H. Davis[3], the then State Apiary Inspector of AR, described the honey as water white and of good quality. Erickson[4] reports that the honey is white to extra light amber and "characteristically flavored". I personally find the common descriptions of the flavor of soybean honey as "distinctive" or "characteristically flavored" interesting, but have to admit to not knowing what these descriptions mean.

Pollen: Much like the variability in soybean nectar production, pollen production is also apparently quite variable. Palmer et al.[21] found from five soybean lines that the number of pollen grains per anther ranged from 374 to 760. The number of pollen grains from the single stamen and the individual stamens of the staminal sheath did not differ significantly except under greenhouse conditions. Erickson[5] also states that the amount of pollen produced by different cultivars varies considerably and little soybean pollen may be gathered by bees in some areas while in other areas, soybean pollen may comprise over 50% of the pollen collected by a colony. Jaycox[9], in a 1965 study found that 71% of the bees in a soybean field carried some soybean pollen in their pollen baskets. In a 1966 study[10] he found between 23 to 85% of the bees returning to the hive carried soybean pollen between July 18 and August 4. The percentage varied with the time of day with 27% at 8.45h, 64-67% at 12.00 h and by 4.00 h it had dropped to 9%. After July 30, essentially no soybean pollen loads were detected.

Jaycox[9] describes soybean pollen loads as typically gray-brown in color and tending to be slightly smaller than other pollen types removed by a pollen trap. The individual pollen grains were described as "round with very fine granulations on the surface" and were most easily confused with pollen from white clover, but were claimed to be not especially difficult to distinguish under a microscope. Erickson[4] also found pollen loads to usually be small and range in color from gray to brown.

The May column will describe how factors other than varietal differences affect soybean honey production, as well as the prospects for cross pollination and the development of hybrid soybeans.

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[6] **Waller[31], in a laboratory study demonstrated that honey bees seemed to prefer nectars rich in sucrose, but studies by Southwick et al. [29] in field experiments, while not providing any insect species data, state "Insect Pollinators did not seek nectars of specific sucrose-hexose ratios, but instead took nectar where caloric reward and accessibility made it more profitable." To me it seems risky, without more data, to conclude that the sucrose-rich nectar of some soybean varieties in the Severson and Erickson research would lead to greater honey bee attraction than those with lower sucrose levels.**

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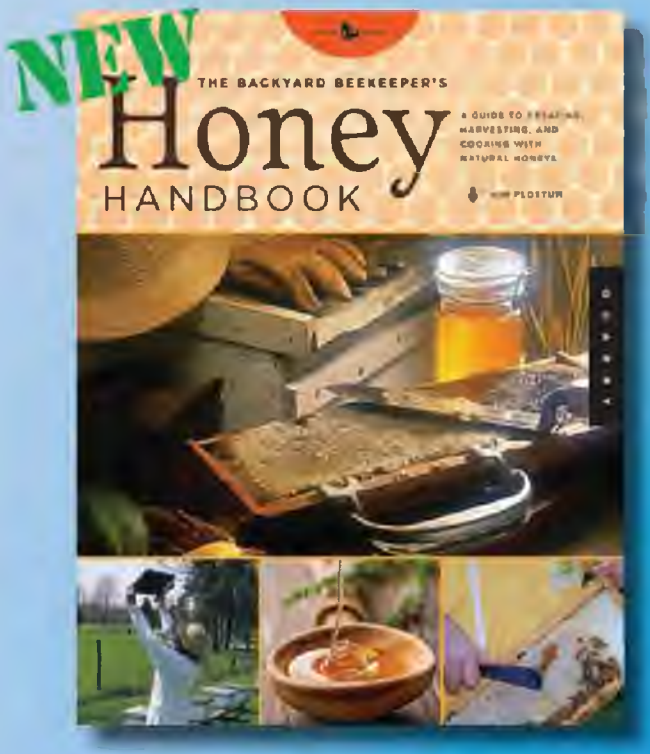

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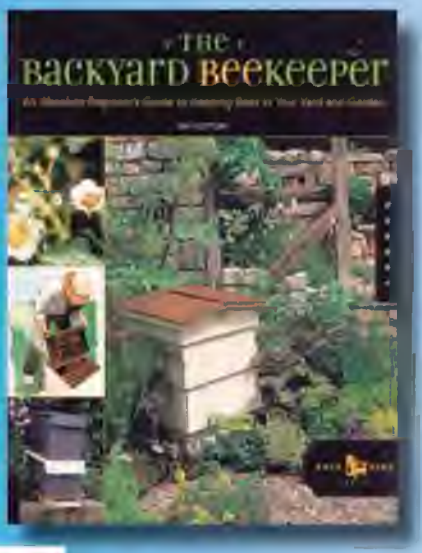

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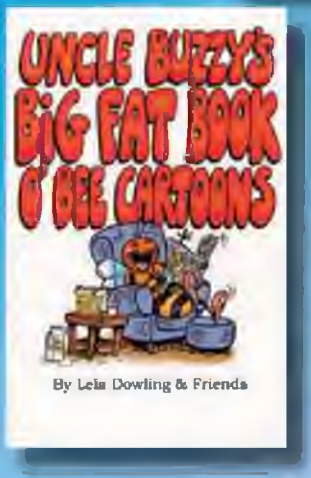

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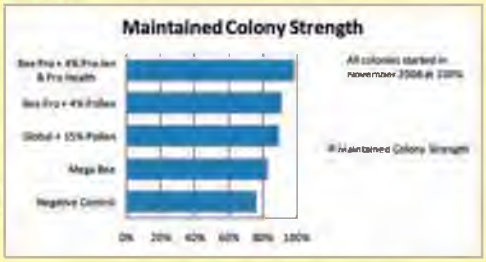

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