American Bee Journal

VOLUME 150 NO. 2 FEBRUARY 2010

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Email
info@americanbeejournal.com
Web
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February Cover Picture

Rebecca Eldridge of Orleans, IN took this beautiful photo of a honey bee on a chicory blossom. She says, "I am 14 years old and a beginning beekeeper. I completed a 4-H project entitled Safe Handling of Bees this year that received a grand champion award at the county fair and a blue ribbon at the Indiana State Fair. My dad kept bees when he was younger and now the entire family enjoys it."

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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!

BEEKEEPERS' SURVEY

I, along with Wendy Schweigert and a team of her students from Bradley, will be conducting research about beekeepers and their characteristics. The results of this research will be used to identify characteristics of those who chose to become beekeepers, to compare various subgroups of beekeepers with each other, and to compare other groups with beekeepers.

If you are 18 years or older and keep bees, you are invited to be a part of this research by completing a short anonymous survey about beekeepers. We are interested in new beekeepers as well as those who are experienced. Hobbyist, sideliners and commercial beekeepers are all invited to participate. The survey can be found at [URL for survey on surveymonkey.com]. The survey will be available online until February 14, 2010.

If you have any questions about this research, please feel free to contact Dr. Wendy Schweigert **wendy@bumail.bradley.edu**

To access the survey click on the following link, or cut and paste it into your browser. **https://www.surveymoney.com/s/9NSWHZ5**

Larry Krengel
lkrengel@mc.net

FLORIDA HONEY STANDARD EXEMPTION REQUESTED

According to the Constitution of the Florida State Beekeepers Association (FSBA), Article IV, "The general management of this Association is vested in a Board of Managers." This Board is composed of one representative from each of the local associations. Members of the Florida State Association who are not affiliated with a local association have no representation; the annual or semi-annual business meetings are the only opportunities when these members can voice their position and vote on issues that pertain to the State Association as a whole and not just the Board of Managers.

At a Board of Managers conference call, Feb. 26, 2009, Ellyn Hutson, representative for the Apalachee Beekeepers Association, made a motion that the Board endorse the resolution previously submitted by them to allow beekeepers who produce less than 1000 gallons (approximately 20 barrels) of honey annually be exempt from Florida's Food Safety laws requiring a certified food establishment for bottling. The Executive Secretary was directed to ship the resolution to all Board representatives for an endorsement they could present to the state legislature in the upcoming March 2010 session.

In an email, dated March 5th, the Executive Secretary stated that all votes must be received by March 11th. Any representative not voting would be counted as a "yes" vote. The Board of Managers vote was not unanimous. The representative from the Beekeepers of Putnam County abstained; since less than fifteen (15) days had transpired since the call for the vote and the deadline, she had no time to meet with her association to determine its position. The representative also indicated that while the "general management" of the State Association rested with the Board of Managers, it was her opinion, the Board could not endorse a resolution on behalf of the FSBA without first presenting it for vote at the general membership business meetings.

In a recent email, dated November 26, the Executive Secretary stated that although the February 26 motion had been approved by the Board via "e-mail straw vote," it "was never acted on so the matter never really went anywhere." The resolution was not put up for vote to the general membership at the recent November 4th FSBA annual meeting.

At the July 29, 2009, State of Florida Honey Bee Technical Council meeting, a motion was made from the floor asking the Council to endorse the 20 barrel exemption resolution. Council President Merritt tabled the discussion, suggesting that since The State of Florida had just adopted the first honey standard in the nation, the advocates of the resolution should wait "two or three years" before pursuing the endorsement again.

Nancy Gentry
State of Florida Honey Bee Technical Council
Florida

NEONICOTINOIDS BANNED IN SOME EUROPEAN COUNTRIES

The fact that France, Germany, Italy, and Slovenia and The Co-Operative Ltd. in UK have banned the neonicotinoid pesticides is not mentioned in the Randy Oliver article [Dec. 2009]. Also not mentioned in the new DVD-Nicotine Bees and the new movie - Vanishing of the Bees. - both strongly blame the Bayer pesticides.

Those who consider the neonicotinoids as harmless improvements should read what David Buffin wrote in *Pesticide News* No. 62, December 2003, pages (22-23) telling about the negative effects of Imidacloprid.

Instead of "bashing" those who disagree with them, the researchers should be concerned with articles like - "Why We Need Bees and More People Becoming Organic Beekeepers" in Organic Consumers Association - Chelsea Green Publishing, Nov. 6, 2009. I quote from the article:

"Little thought is given to the chemical's breakdown products which can prove to be more toxic and longer lasting than the original chemical itself, such as the case of Imidacloprid Olefin, which is produced as the neonicotinoid Imidacloprid degrades. Once in use and released into the environment, chemicals and their breakdown products will combine with chemicals already in the environment to form new compounds. The synergestic effects of some of these combinations have proven to be hundreds of times more toxic than either compound on its own."

A movie has been made - THE LAST BEEKEEPER - and if we continue to ignore available information - that day becomes closer as our environment continues to be degraded.

Lawrence A. DuBose
Retired Civil Engineer PhD.
Almost 40 years beekeeping experience
Carol Stream, IL

HONEY BEE VENOM STUDY

I am writing to inform you of an enrolling clinical trial that may be of interest to you. We are in need of volunteers who have osteoarthritis knee pain to test pure honeybee venom injections to reduce swelling and pain. I am wondering if you can assist us in identifying perspective patients. If possible, please circulate the attached flier to anyone who might be interested in this study. I appreciate your time and efforts.

Sincerely,
Antoinette Velez
Lead Recruitment Specialist
Radiant Research
515 North State Street, Suite 2700
Chicago, IL 60654
tel 312-494-2256
fax 312-494-2201
email:antoinettevelez@radiantresearch.com
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WINE BARREL BEES

This summer a swarm landed in my backyard wine barrel. I am trying to transfer them to a super. They are getting sugar water and pollen cakes. In the other photo it looks like they made a queen cell. It is now December and they are making brood and honey. I think this transfer tube is working. Next spring I will take apart the barrel, which has about 75 pounds of added weight to it, and see if the queen is in there still. I haven't seen her in the new box yet. The only way to take apart the barrel is to destroy it and hope the queen isn't crushed. Wish me luck. Please E-mail me with comments. I would love to see this in your "Letters to the Editor" section. Thanks, Rick.

Rick Bucher
112 Oakmeade Ct.
Vacaville, Ca. 95687
(707)447-1157
rgbucher@netzero.net

Wine barrel connected to hive (Rick Bucher photos)

Queen cell constructed on frame from transfer hive.

YELLOW JACKET PROBLEMS

This fall I was having a big problem with yellow jackets robbing a weak hive, so I set this up as a feeder. It worked very well with almost no drowned bees. But the yellow jackets came up through the two deep hive bodies and fed right here. They don't happen to be in this picture, but I would take the top cover off, reach in and squash the yellow jackets. Unfortunately the hive doesn't look like it's going to make it. I chose not to combine the hive, because of the presence of the robbing yellow jackets.

John Griffin

This is where the yellow jackets came up through the hive to feed. (John Griffin photo)

HIVE STAND WITH ENTRANCE

When I got interested in beekeeping a couple of years ago I decided to use 8-frame equipment. Most hive accessories are available for 8-frame boxes with perhaps one exception, and that would be sturdy Screened Bottom Boards (SSB) that do not require a hive stand. For my first hives I modified some SBB's that I purchased unassembled from W.T. Kelley. The "Original Screened Bottom Boards" from Kelley's are built from 2X4's. I liked the possibility of mounting legs to the stand easily.

While appreciating the ruggedness of a heavily built screened bottom board, I often thought that it would be interesting to combine the features of a slatted rack in the same assembly. Doing so seemed like it would require even larger wood (2x6"), but that would be far too heavy. I came upon an idea while thinking about eventually using upper entrances.

If I had upper entrances, I figured that there wouldn't be any need for the conventional hive entrance, especially since the hives would have screened bottoms. Hives could sit flat on stands without any entrance... and then it occurred to me that an entrance could be cut into the stand itself! This may result in unusual looking hives, but in time, I believe my stands will prove to be an effective alternative to two or three different beehive accessories.

Joseph Stafford
Greenwich, CT

The entrance is cut with a router at an angle, so rain can't enter the hive.

The entrance slot brings the bees onto the varroa screen. The grooves for the varroa screen and sticky board can be seen in this photo.

While this won't be put into use until the spring, I can almost see the bees walking up the ramp.

OUR RECORD COMB HONEY PRODUCTION IN 1951

In the summer of 1913, Dr. C.C. Miller noted author lecturer and producer of section comb honey established a world record of 266 section average from 72 colonies of bees. One particular hive produced 402 sec-

tions. In the year of 1951, my father and I just finished preparing and transporting 1000 colonies of bees to our summer locations in north central Illinois. Our family at that time used these colonies strictly for section comb honey production. All colonies had been wintered in double brood chambers and later reduced to a single brood chamber with queen for the summer flow. We were unaware of the type of crop we were to get that year. During the winter, we had prepared 8,000 8-frame comb honey supers and had also made several thousand cutcomb frames to fit in our section supers. Each year near the end of the honey flow, after removing the last section super, we gave the colony a cutcomb super. We did not want partly filled sections when the flow ended. Our policy was never to use partly filled sections during next year's flow.

The area of Illinois where our yards were located was on black prairie soil owned by Menonite farmers. Instead of commercial fertilizers being used, various clovers were planted in the crop rotation system. Clovers consisted of alsike, red, sometimes called Big English or mammoth red, yellow sweet, white sweet, and in some areas a new cultivar of white sweet clover called "Ohio Evergreen". After most of the other clover fields browned and turned to seed, this variety was coming into full bloom. Most farms also had dairy cows.

Finished supers were removed by placing them over an inner-cover. Our out-yards averaged 60 colonies, but one particular yard contained 100 hives in a 60-acre field of sweet clover. The bees were placed on the highest elevated part of the field. I remember standing in the back of the truck in that fragrant field of clover and seeing over 1000 acres of clover fields within flying distance of the yard. Each colony was given one section comb honey super. A week later we returned and began our swarm control procedure. Each hive was storing some honey in the supers, but also beginning to build queen cells in the brood chamber. All queens had their wings clipped in early spring, so we were not worried of losing a swarm at that time. We removed these year-old queens from each colony. The colony remained queenless for eight days. During those eight days all queen cells were destroyed and then given a new queen reared from our own comb honey breeding stock. Each hive was numbered and yearly records recorded. By luck, no heavy rains interrupted the heavy flow from May through mid September.

Supers were added often while raising the fuller supers to the top of the hive. While working the hives, my father and I had to shout to each other over the roar of the bees. Finished supers were placed over an inner-cover containing a Porter bee escape. Those hives that were somewhat behind in production were given six to eight of these supers. Bees remaining in these supers helped increase the population in the colony below. We would return two to three days later to remove the finished supers.

Going back to my 1951 diary I had recorded "Removed 500 supers today". What was amazing, during the middle of the flow, a super given one day was completed in 3-5 days. Supers were still being given through August of that year. On July 30th my father notified Dadant & Sons, Inc., publishers of the *American Bee Journal*, of the great honey crop we were experiencing in this particular yard. A short article appeared in their September 1951 issue about the record setting season. One colony also produced three cutcomb supers over the average.

Yes, I did breed queens from this colony the following spring. My mother and wife, Katy, scraped and cleaned the sections as my father and I were working the bees. It was nothing unusual to find 1320 clean comb honey sections (55 supers) stacked high on the work benches when we came home from the outyards. Dr. Vern Milum, professor and honey judge, University of Illinois, stated, "The most beautiful comb honey I have ever seen."

The final total of this world record from 100 colonies of bees was an average of 336 sections from each colony. Looking back, the irony about this record was, we sold this crop to other beekeepers and honey packers with their label on the sections. We sold the comb honey for $3.60 per case of 24 sections. Most of the sections weighed 15 to 16 oz. Today a 12 oz. cut of comb honey ranges from $8.00 to $16.95 as found on the Internet. Records are made to be broken. I hope some beekeeper can, but he or she will have to find those clover fields that were so plentiful years ago. Some readers may not believe this story, but I still have the records to prove it.

Eugene Killion
Killion & Son Apiaries
Paris, IL

OBSELIDIA - BEEKEEPING PLAYS AN IMPORTANT ROLE IN THIS MOVIE

I'm working on a wonderful film called *Obselidia* directed by Diane Bell. It's playing at the 2010 Sundance Film Festival in Utah in Dramatic Competition. Beekeeping plays an important role in the movie. One of the supporting roles is actually a beekeeper in the desert in California. The reason I'm emailing is Obselidia is a very low-budget film so we're trying to build awareness from the ground up through people who the film might appeal to, beekeepers being one of them.

What is it about?

Obselidia is about the last door to door encyclopedia salesman in the US. He travels around California interviewing people whose job is becoming obsolete. That's how he meets the beekeeper in Death Valley. The character is a climatologist so he goes out there to discuss the disappearance of the bees and what will happen to humans. Along the way he meets a girl and falls in love and realizes he's been living in the past for so long he's missed out on the present.

What we need is as much awareness and publicity as possible, even if it's just word of mouth. Our film's budget is smaller than some of the other movies' marketing budgets. If we could get a mention in a newsletter, an interview with our filmmaker or a broad email to your members, any support like that would truly help this wonderful little film.

Beekeeping plays a major role so the plight of bees gets broadcast to a wider audience.

Here is a link to the trailer: **http://www.youtube.com/watch?v=Qhly0dt8Fj0**

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Founder/CEO
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APALACHEE BEEKEEPERS ASSOCIATION AND NORTH FLORIDA FAIR HOST 1ST ANNUAL WELSH HONEY SHOW

On Nov. 8, the 69th Annual North Florida Fair presented the 1st Annual Welsh Honey Show in partnership with Apalachee Beekeepers Association (ABA). The Fair draws over 90,000 visitors from 27 North Florida counties, South Georgia and Alabama each year. We know this was the first Welsh Honey show at a state or regional fair in Florida and possibly the nation. Welsh shows have been limited to events targeting beekeepers or local beekeeping associations, according to Virginia Webb of Clarkesville, Ga. Virginia is also a Welsh honey judge.

I met with Mark Harvey, executive director of the North Florida Fair in March to see if they would be interested in hosting this show if the ABA provided the volunteers and handled logistics for the event. Mark and his staff were delighted to participate and gave ABA freedom to do whatever we wanted plus a prime location. Several meetings were held to work out the details and over time Mark and his staff became much more "bee savvy" and increasingly excited about this event. Each time we met they had more questions about beekeeping.

Entries were judged in 12 classes and there was a best of show. The show had a good turnout with many entries, which was impressive for this first time event. We expect greater participation next year. The judging was open to public viewing and this gave ABA members the opportunity to talk about the Welsh show while also educating the pubic on the products from the hive, as well as the importance of bees to our environment and Florida's economy. The three

judges, with their white hats and coats drew in many observers for the judging. The winning entries remained on display until the end of the fair. The ABA's booth remained open all 10 days of the Fair and was located next to the displayed winning entries. This gave ABA an excellent location to meet with the public and distribute educational materials.

The North Florida Fair was very pleased and we hope this will be the first of many Welsh shows at this fair. It would be great to see Welsh shows at state fairs across the nation, so I encourage all of you to approach managers of events such as this and offer to sponsor a Welsh Honey Show. It is an excellent opportunity to meet the public and teach them more about what we do.

Roger Twitchell
Florida

Winning entries with ribbons

Judges: Tom Heifner; Ellyn Hutson and Roger Twitchell

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MSU RESEARCH MAY LEAD TO NEW WAYS TO CONTROL HONEYBEE PARASITE

Ke Dong is a Michigan State University professor of entomology.

East Lansing, Mich.—Ground-breaking discoveries by Michigan State University researchers could help protect honey bees from deadly parasites that have devastated commercial colonies.

The MSU researchers for the first time were able to produce in the laboratory proteins that help channel sodium ions through cell membranes of parasites known as Varroa mites. The research, using cellular frog eggs, also found that these proteins react to chemcals differently than the sodium channel proteins in honey bees, a finding that could be a key to controlling the mites.

"The insecticide used to control Varroa mites, fluvalinate, targets the mite sodium channel," said Ke Dong, MSU professor of entomology. "But the mites are becoming resistant to fluvalinate. Successfully producing the mite sodium channel in the lab now allows scientists to develop new chemicals that target the mite sodium channel but don't affect the honey bee's."

Fluvalinate paralyzes the mite and eventually kills it. But in addition to the problem of growing mite resistance, the pesticide can harm bees and contaminate honey if not used extremely carefully.

The MSU scientists also found two amino acids in the mite sodium channel that make the mite resistant to tetrodotoxin, or TTX, a deadly poison found in pufferfish not currently used as an insecticide.

"Chemicals such as fluvalinate and TTX target sodium channels in insects and mites, so this basic research opens the door for more applied research on chemicals to control mites and other pest insects," Dong said. Other members of the MSU team are Yuzhe Du, senior research associate;Yoshiko Nomura, visiting scholar; Zhiqi Liu, former research associate; and Zachary Huang, associate professor, all in the Department of Entomology.

HARVARD ROBOBEES PROJECT RECEIVES RESEARCH FUNDING

INSPIRED by the biology of a bee and the insect's hive behavior ...we aim to push advances in miniature robotics and the design of compact high-energy power sources; spur innovations in ultra-low-power computing and electronic "smart" sensors; and refine coordination algorithms to manage multiple, independent machines. BTW, our robobees don't sting...

A multidisciplinary team of computer scientists, engineers, and biologists at Harvard received a $10 million National Science Foundation (NSF) Expeditions in Computing grant for RoboBees, a colony of small-scale mobile robotic devices.

Vision and Aims

The collaborators envision that the Nature-inspired research could lead to a greater understanding of how to artificially mimic the collective behavior and "intelligence" of a bee colony; foster novel methods for designing and building an electronic surrogate nervous system able to deftly sense and adapt to changing environments; and advance work on the construction of small-scale flying mechanical devices.

More broadly, the scientists anticipate the devices will open up a wide range of discoveries and practical innovations, advancing fields ranging from entomology and developmental biology to amorphous computing and electrical engineering.

Through a relationship with the Museum of Science, Boston, the team will also create an interactive exhibit to teach and inspire future scientists and engineers.

Body, Brain, and Colony

From flies to fish to lobsters, small insects and animals have long been ideal models for roboticists and computer scientists. Bees, for example, possess unmatched elegance in flight, zipping from flower to flower with ease and hovering stably with heavy payloads.

Body

By leveraging existing breakthroughs from Professor Wood's Microrobotics Lab, which conducted the first successful flight of a life-sized robotic fly in 2007, the team will explore ways to emulate such aerobatic feats in their proposed devices. In addition, achieving autonomous flight will require compact high-energy power sources and associated electronics, integrated seamlessly into the 'body' of the machine.

Brain

One of the most complicated areas of exploration the scientists will undertake will be the creation of a suite of artificial "smart" sensors, akin to a bee's eyes and antennae. Professor Wei explains that the ultimate aim is to design dynamic hardware and software that serves as the device's 'brain,' controlling and monitoring flight, sensing objects such as fellow devices and other objects, and coordinating simple decision-making.

Colony

Finally, to mimic the sophisticated behavior of a real colony of insects will involve the development of sophisticated coordination algorithms, communications methods (i.e., the ability for individual machines to 'talk' to one another and the hive), and global-to-local programming tools to simulate the ways groups of real bees rely upon one another to scout, forage, and plan.

The Team

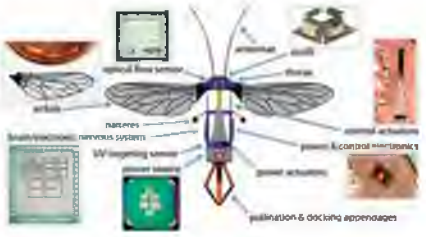
The investigators, primarily based at Harvard's School of Engineering and Applied Sciences, will coordinate efforts with faculty from the Department of Organismic and Evolutionary Biology in the Faculty of Arts and Sciences at Harvard and Northeastern University's Department of Biology.

In addition, Centeye, a microelectronics firm in Washington, D.C., specializing in vision chip and visual sensor technology, will contribute technical knowledge.

A number of the collaborators are core faculty members of the newly created Wyss Institute for Biologically Inspired Engineering. As the work fits particularly well with Wyss's mission of "creating new materials and devices using Nature's design principles," the Institute, along with SEAS, will play a critical role in supporting the research, providing laboratory space and in-kind financial support.

Funding

Harvard is one of three lead institutions



receiving the latest round of awards under the NSF's Expeditions in Computing program.

The program, established last year by the Directorate for Computer and Information Science and Engineering (CISE), provides the CISE research and education community with the opportunity to pursue ambitious, fundamental research agendas that promise to define the future of computing and information and render great benefit to society. Funded at levels up to $2,000,000 per year for five years, Expeditions represent some of the largest single investments currently made by the directorate. **(Harvard School of Engineering and Applied Sciences News Release)**

FINAL MOMENTS OF BEE LANDING TACTICS REVEALED

Landing is tricky: hit the ground too fast and you will crash and burn; too slow and you may stall and fall. Bees manage their approach by monitoring the speed of images moving across their eyes. By slowing so that the speed of the looming landing pad's image on the retina remains constant, bees manage to control their approach. But what happens in the final few moments before touch down? And how do bees adapt to landing on surfaces ranging from the horizontal to upside-down ceilings? Flies land on a ceiling by simply grabbing hold with their front legs and somersaulting up as they zip along, but a bee's approach is more sedate. Mandyam Srinivasan, an electrical engineer from the Queensland Brain Institute, The University of Queensland and the Australian Research Council's Vision Centre, knew that bees must be doing something different from daredevil flies. Curious to know more about bee landing strategies Srinivasan teamed up with Carla Evangelista, Peter Kraft, and Judith Reinhard from the University of Queensland, and Marie Dacke, visiting from Lund University. The team used a high-speed camera to film the instant of touch down on surfaces at various inclinations and publish their discoveries about bee landing tactics in *The Journal of Experimental Biology* on December 28 2009 at **http://jeb.biologists.org**.

First the scientists built a bee-landing platform that could be inclined at any angle from horizontal to inverted (like a ceiling), then they trained bees to land on it and began filming. Having collected movies of the bees landing on surfaces ranging from 0deg. to 180deg., and every 10deg. inclination between, Evangelista began the painstaking task of manually analyzing the bees landing strategies, and saw that the bees' approach could be broken down into 3 phases.

Initially the bees approached from almost any direction and at any speed, however, as they got closer to the platforms, they slowed dramatically, almost hovering, until they were 16mm from the platform when they ground to a complete halt, hovering for anything ranging from 50ms to over 140ms. When the surface was horizontal or inclined slightly, the bees' hind legs were almost within touching distance of the surface, so it was simply a matter of the bee gently lowering itself and grabbing hold with its rear feet before lowering the rest of the body.

However, when the insects were landing on surfaces ranging from vertical to 'ceilings', their antennae were closest to the surface during the hover phase. The team saw that the antennae grazed the surface and this contact triggered the bees to reach up with the front legs, grasp hold of the surface and then slowly heave their middle and hind legs up too. "We had not expected the antennae to play a role and the fact that there is a mechanical aspect of this is something that we hadn't thought about," admits Srinivasan.

Looking at the antennae's positions, the team realized that in the final stages as the insects approached inverted surfaces, they held their antennae roughly perpendicular to the surface. "The bee is able to estimate the slope of the surface to orient correctly the antennae, so it is using its visual system," explains Srinivasan. But this is surprising, because the insects are almost completely stationary while hovering and unable to use image movement across the eye to estimate distances. Srinivasan suspects that the bees could be using stereovision over such a short distance, and is keen to test the idea.

Finally, the team realized that bees are almost tailor made to land on surfaces inclined at angles of 60deg. to the horizontal. "When bees are flying fast their bodies are horizontal, but when they are flying slowly or hovering their abdomen tilts down so that the tips of the legs and antennae lie in a plane that makes an angle of 60deg." explains Srinivasan: so the legs and antennae all touch down simultaneously on surfaces inclined at 60 deg. "It seems like they are adapted to land on surfaces tilted to 60deg. and we are keen to find out whether many flowers have this natural tilt," says Srinivasan.

Srinivasan is optimistic that he will eventually be able to use his discoveries in the design of novel flight control systems. ***Journal of Experimental Biology***

ALBERTA PROVINCIAL APICULTURIST DR. MEDHAT NASR RECEIVES DISTINGUISHED ACHIEVEMENT AWARD FROM ALBERTA BEEKEEPERS COMMISSION

Alberta Provincial Apiculturist, Dr. Medhat Nasr, is the recipient of the Distinguished Achievement Award from Alberta Beekeepers Commission and was honored at the Annual General Meeting of Alberta Beekeepers Commission on Wednesday November 4, 2009. Dr. Nasr is an internationally recognized expert on honey bee pests management.

Dr. Nasr has developed an internationally recognized Integrated Pest Management Program focused on industry growth and sustainability. This program includes applied research, extension and regulations. He has a broad knowledge of honey bees and the beekeeping industry. His activities are critical components for the success of the beekeeping industry in the face of recent challenges.

He played a significant role in opening the continental USA border for honey bee queen imports and facilitating access to bee packages and queens over the years from Australia, New Zealand, Hawaii and Chile. He was instrumental in acquiring full registration of CheckMite for Varroa control. In 2007, with the surge of high winter losses of honey bees he worked with industry in persuading the Pest Management Regulatory Agency to register Apivar, a French miticide known to be effective against Varroa mites. This work unquestionably helped the Alberta industry to improve honey bee health across Canada generally.

For the past seven years, Dr. Nasr has been conducting research to develop Pest Management and Pest Surveillance Programs to control honey bee pests. He partnered with industry members to develop a novel machine to safely and effectively apply pesticides in bee colonies. He continues to work tirelessly to develop and implement new techniques for monitoring and controlling pests to restore honey bee health. In doing so, he gives a significant number of presentations every year, publishes a monthly article in the *Alberta Bee News*, the industry newsletter, and teaches apiculture courses and workshops.

Dr. Medhat Nasr, recipient of 2009 Distinguished Achievement Award from the Alberta Beekeepers Commission

He also assists beekeepers through telephone responses and one-on-one visits.

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.glorybeefoods.com**

CALIFORNIA

2010 Specialized Classes to Promote Stock Improvement

Taught by Susan Cobey and offered at the Harry Laidlaw Honey Bee Research Facility at UCD, in Davis California.

1. THE ART OF QUEEN REARING WORKSHOP. Two, One day workshops will be offered March 31 and April 7th. The class is designed to provide an understanding and appreciation of what it takes to rear high quality queens. Basic biology and principles of queen rearing will be presented. Registration $125 per class. Signup deadline Mar. 15, 2010.

Optional Queen Production Tour, Thursday Apr. 1st. and April 8th., 2010. For those who would like to see large scale commercial queen production, an optional one day tour will be offered following the Queen Rearing Workshops. We will visit several northern California producers during their busy spring season. You will observe techniques and systems involved in commercial queen production. This tour is optional and open to class members only. It will be scheduled the day after the Queen Rearing Classes. Tour Fee $50.

2. INSTRUMENTAL INSEMINATION & BEE BREEDING WORKSHOP, April 14, 15 & 16, 2010. This class is designed for commercial beekeepers who are involved in a breeding program and for laboratory personnel requiring the skill for research purposes. A practical hands-on approach to instruction is provided with emphasis on individual attention, therefore classes are kept small. Registration $425. Signup deadline Apr. 1, 2010.

3. The ADVANCED WORKSHOP ON INSTRUMENTAL INSEMINATION, April 22 & 23, 2010 Designed as a follow-up to the Instrumental Insemination course,

Bee breeder-geneticist Susan Cobey instructs Francisco Beytia Wyss (left) and Giovanna Rojas Magna from Chile. *(Photo by Kathy Keatley Garvey)*

the focus of this class will be perfecting insemination techniques and solving individual problems in the laboratory and in the field. The class is recommended for those with some experience. Registration $375. Signup deadline Apr. 1, 2010.

For Information:
Susan Cobey **swcobey@ucdavis.edu**
http://entomology.ucdavis.edu/courses/beeclasses
University of California, Davis
Dept. of Entomology
Harry Laidlaw Honey Bee Research Facility
367 Briggs Hall
Davis, CA. 95616-8584
Tel. 530-754-9390 Fax 530-754-7757

ARIZONA

3rd Organic Beekeepers Chemical Free Conference, Oracle, Arizona March 5-7, 2010

As the Organic Beekeepers yahoo.com discussion group has now grown in numbers to over 3000+ members, we have put together our 3rd meeting for an American Beekeepers Association, for beekeepers into Organic Beekeeping, to come together to associate for clean sustainable beekeeping with ZERO treatments and getting off the artificial feeds and artificial inbreeding parameters..
For more information see:
http://www.tucsonymca.org/site/c.grLOK1PJLqF/b.691235/k.D62C/Retreat.htm or **http://www.tucsonymca.org or visit OrganicBeekeepers at http://groups.yahoo.com/group/organicbeekeepers/** or contact Dee Lusby for information/registration at: 520-398-2474 eve. For payment of registration per person of $150, due in advance of attending, send to Organic Beekeepers c/o Dee Lusby, HC 65, Box 7450, Amado, Arizona 85645, with stamped self addressed envelope for returning receipt and more information on YMCA to sender, plus liability/medical form to be filled out. Note: $150 fee is a straight fee whether sleeping/eating at camp or not. For general information concerning the meeting, other contacts are Keith Malone (Alaska) 907-688-0588, and Ramona/Dean at 978-407-3934

NEBRASKA

University of Nebraska Cooperative Extension

Everything You Need to Know to Succeed in Apiculture

Beginning Beekeeping Workshops
Hastings, NE - Feb. 27, 2010
Nebraska City, NE – March 13, 2009

Beginning Beekeeping Field Day
Ithaca, NE - April 17, 2010

Master Beekeeping Workshop
Ithaca, NE - June 10-12, 2010

Beginning Beekeeping workshops have been scheduled for 2010 at the following sites:

Feb. 27 - Hastings 9:00 AM - 5:00 p.m.
Mar. 13 – Nebraska City 9:00 AM - 5:00 p.m.
April 17- Ithaca 10:00 AM - 2:00 p.m.

Registration fee for the Hastings and Nebraska City workshops is $20 per person plus $6 each for additional family members. Registration includes lunch, refreshments and a workbook for new beekeepers. Preregistration is required for both workshops. The Ithaca Workshop is a hands-on session for participants in both the Hastings and Nebraska City Workshops. 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 workshops or need further information, contact: Marion Ellis at:
Email: **mellis3@unl.edu**
Phone: (402) 472-8696

Send Hastings Registrations to:
Dr. Ron Seymour, Assoc. Extension Educator
Adams county Extension Office
300 North Joseph Avenue
Room 103
Hastings, NE 68901-7597
Email: **rseymour1@unl.edu**
Phone: (402) 461-7209
Make check to: University of Nebraska

Send Nebraska City Registrations to:
Vaughn Hammond, Extension Technologist
5985 G Road
Kimmel Education and Research Center
Nebraska City, NE 68410
Email: **vhammond2@unl.edu**
Phone: (402) 873-3166
Make check to: University of Nebraska

2010 Master Beekeeping Workshop
A 3-day Master Beekeeping Workshop will be offered in Ithaca, Nebraska at the Agricultural Research and Development Center

Headquarters Building on June 12-13. 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 handson 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

MISSOURI

Eastern Missouri Beekeepers To Host Third Annual Beekeeping Workshop

Leading Midwestern Educators to Present Courses for Beginners and Experienced Beekeepers

St. Louis, Missouri, November 25, 2009 – The Eastern Missouri Beekeepers Association will offer full-day courses of instruction for beginning and experienced beekeepers on Saturday, Feb. 20, 2010, from 8:00 a.m. to 4:30 p.m. at Maritz in Fenton, Missouri. Space is limited, and will be filled on a first-come-first-served basis.

The courses will be led by Grant Gillard, Vice President of the Missouri State Beekeepers Association, Gary Reuter, Staff Scientist at the University of Minnesota, Department of Entomology, and Joli Winer, 1st Vice President of the Kansas Honey Producers Association.

Lunch and refreshments will be provided. The registration packets will include course materials, beekeeping periodicals, and equipment catalogs.

The February courses will be followed throughout the season by field workshops as well as equipment and honey bee procurement projects, which are sponsored and led by EMBA members.

Registration is available online starting Dec. 4, 2009, at **www.easternmobeekeepers.com**, or by completing and mailing the downloadable registration form.

Tuition cost is $75 per person prior to February 1st. Tuition cost is $90 per person for those registering on or after February 1st. Registration closes February 13th unless filled sooner. There will be a waiting list, if needed. More participant information on the workshop is available by calling 314-894-8737 or online at **www.easternmobeekeepers.com**.

INDIANA

The Indiana Beekeepers' Association (IBA) will hold its Indiana Bee School VII in Indianapolis, Indiana on Saturday, February 28, 2009. It will be held at the Southport Presbyterian Church on 7525 McFarland Boulevard. This is an excellent facility with plenty of room for our breakout sessions and is very accessible.

Randy Oliver, a commercial migratory beekeeper from Grass Valley, California, has agreed to be our keynote speaker for the school. He writes for the *American Bee Journal* and maintains the website **www.scientificbeekeeping.com**. We are especially excited to have him at our school. Don't you dare miss this one!

We are planning to have three or four breakout sessions, with each session having four or five different topics to choose from. Lectures, hands-on workshops and discussions will be held for beekeepers with any level of skill, experience or ability.

Topics on introductory beekeeping tools and techniques as well as learning opportunities for the more advanced beekeeper will be available. Along with a great program are a raffle, an auction and a variety of vendor displays and supplies from several of the top vendors (such as Brushy Mtn., Dadant, Walter Kelley Co. and others).

You will have a chance to meet and informally visit with beekeepers from across the state. On-site registration starts at 8:00 A.M. (EST) with program starting promptly at 9:00 A.M. and concluding at 3:30 P.M. Registration fee will be $25.00 per individual or $35.00 per family (lunch included). To guarantee a spot for yourself, your registration form must be received by February 20, 2009.

For future updates join the **Indiana Beekeepers' Association** and get all of the information in the upcoming newsletters or contact Steve Doty 317-485-5593 or **jsdoty@indy.net** or **http://indianabeekeeper.goshen.edu**.

MICHIGAN

Advanced Bee Biology and Beekeeping

Dewey M. Caron and Lawrence J. Connor, Instructors
Comstock Community Center, Comstock, MI

March 9, 11, 16 and 18, 2010
6:30 to 9:00 PM each evening

Sponsored by Wicwas Press
Pre-Registration: $75 per person or $100 per couple with Caron's book*
Pre-Registration: $50 per person or $90 per couple without Caron's book*
Participants are expected to have kept bees at least one season.
Registration at www.wicwas com or 1620 Miller Rd., Kalamazoo, MI 49001

March 9 (Tuesday)
6:30 Introduction - Larry Connor
6:45 Natural History of the Bee Colony Dewey Caron
7:45 Break
8:00 Spring Management & the Colony Cycle - Larry Connor
9:00 Study Questions
March 11 (Thursday)
6:30 Discussion from first session
6:45 Swarming - Dewey Caron
7:45 Break
8:00 Making Increase Colonies - Larry Connor
9:00 Study Questions
March 16 (Tuesday)
6:30 Discussion from second session
6:45 Bee Losses—Where Are We? - Dewey Caron
7:45 Break
8:00 Bee Floral Essentials - Larry Connor
9:00 Study Questions
March 18 (Thursday)
6:30 Discussion from third session
6:45 Fall and Winter Management - Dewey Caron
7:45 Break
8:00 Varroa Control by Selection & IPM Larry Connor
9:00 Study Questions
*Additional $15 for at-the-door registration/Single night registration by prior arrangement.

KENTUCKY BEE SCHOOL

Feb 6, 2010
Allen County Beekeepers School
Scottsville, KY

Contact:Allen County Beekeepers Association, John Pace, President
P.O. Box 577, Glasgow, KY 42142-0577
Phone (270)651-6507
Email: **jlpace@glasgow-ky.com**

KENTUCKY

2010 Bluegrass Beekeeping School

The 2010 Bluegrass Beekeeping School on March 13th in Frankfort on the campus of Kentucky State University. (Same location as the last few years.)

The class schedule will again have a beginner's track of classes led by Dr. Tom Webster. Kentucky Beekeeping Extension Specialist from KY State University. In addition, numerous classes of interest to more experienced beekeepers will be offered. Special out-of-state speakers will include Dr. Dave Tarpy, associate entomology professor and apiculture extension specialist from North Carolina State University. Also Michael Bush, from Bush Farms in Nebraska will be part of the program. Additional speakers and program will be available on the website of Phil Craft, Kentucky State Apiarist. A vendor tradeshow will again be part of the program. Due to increased attendance at this school, pre-regis-

tration is encouraged, registration numbers may be limited – see webpage for more information. For more information, including pre-registration forms, contact Phil Craft, KY State Apiarist, 502-564-3956, phil.craft@ky.gov or go to his webpage at **http://www.kyagr.com/statevet/bees/**.

OHIO

OSUE/TCBA Spring Workshop
Friday & Saturday, March 5 & 6, 2010

Ohio State University Extension and Tri-County Beekeepers Association of Northeastern Ohio will hold their 31st Annual Beekeeping Workshop on ***Friday & Saturday, March 5 & 6, 2010***, at The Ohio State University, Ohio Agricultural Research and Development Center (OARDC). OARDC is located on State Route 302 south of US 30 in Wooster, Ohio. This is the largest workshop in the United States.

This year's Workshop theme is: ***Modern Beekeeping – New Ways of Doing Old Things. Dr. Dewey Caron,*** Keynote Speaker will speak about *"CCD & AHB: Not Everything Is All Bad"*.

On Friday, ***March 5, 2010***, will start the Spring Workshop with an evening program with *Dr. James E. Tew*, *Ohio State University Extension Specialist, Apiculture* will talk about "***Good Bees in Bad Places"*** and *Ms. Kathy Summers, Bee Culture Magazine* about ***"Bee Culture Through the Years"*** at OARDC's Fisher Auditorium. Also, that night OSU's Beekeeping Museum will be open for tours. Beverages and cookies will be served to finish the evening.

On Saturday, after the Keynote talk there will be will be breakout sessions on Recognizing Bee Diseases, Beekeeping without Chemicals, Status of Midwest Queens, Urban Beekeeping, Encaustic Painting and a Children's program to list a few. Other interests are the Baking Contest, Door Prizes, Vendor Displays, Bee Museum and a favorite the Hands-on/Demo Room of bee equipment. ***New*** this year will be a 4th breakout session for Basic Beekeeping. Registration starts at 8:00 a.m. with the program starting at 9:00 a.m. until 4:45 p.m. The pre-registration fee is $35.00 per adult over 17 (walk-in registration is $45.00; TCBA members pre-registration $30.00); Children (17 years and under) registration is $5.00 per child. A hot turkey lunch with mashed potatoes, vegetable, and homemade pie or boxed lunch will be offered for an additional charge.

Vendor registration is $75.00 per table with one person's registration included. *For more information contact: Sherry Ferrell at (330) 263-3684, e-mail:* ferrell.6@osu.edu.

OHIO

Lorain County Beekeepers Association

WHEN: Friday, March 5th, Friday, March 12th, Friday, March 19th, & Friday, March 26th
TIME: 7:00 P.M. - 9:00 P.M.
WHERE: FIRST UNITED METHODIST CHURCH, 45 S. Professor St. Oberlin OH
DETAILS: Cost of the class is $45.00 and includes a year membership in L.C.B.A. and a monthly newsletter. A book will also be available for an additional fee.

An educational scholarship essay contest for local youth 9-18 years of age is available and information and form are on the web site.

A hands-on Field Day will be held, Saturday, May 8th, which allows everyone to get up close and personal in an active beehive. For updates and forms and other contact info, please visit LCBA web site at **www.loraincountybeekeepers.org** You can also contact Valerie, **buzzzzeditor@verizon.net** or 419-929-1110

OHIO

Southwestern Ohio Beekeeper School

The 2010 Southwestern Ohio Beekeeper School has been scheduled for March 27th at the Oasis Conference Center in Loveland, Ohio. This school has been held for more than 30 years and is designed for new and moderately experienced beekeepers. The school offers beekeepers an opportunity to choose from 16 different educational sessions and to browse for new equipment from on-site vendors.

Registration costs $35 for adults and $25 for youth under 17 years of age. Lunch is included in your registration fee. Deadline for registration is March 1st and is limited to the first 300 people to sign-up for the school. This event historically fills up before the deadline, so register early. No walk-ins are permitted. For more information or a registration form, go to the Ohio State University Extension in Warren County's website at **http://warren.osu.edu** after January 15th.

PENNSYLVANIA WORKSHOPS

Beginning Beekeeping Workshop

A Beginning Beekeeping Workshop will be conducted from 9 AM to 4 PM on Saturday, Feb. 6, 2010, at Penn State Beaver Campus in Monaca, PA. The workshop is sponsored by Penn State Cooperative Extension, and the beekeeping organizations of Beaver Valley, Armstrong-Indiana, Northwest PA, West-Central PA and Westmoreland County. Workshop participants will learn how to get started in beekeeping and basic management skills. Registration fees are $45 for the primary registrant, and $20 for spouses/guests and children 18 & under. The registration fee includes an information packet (for primary registrant only) and lunch, and paid registrations are required by January 29. For more information, contact Penn State Cooperative Extension at 724-774-3003 or on the web at **http://beaver.extension.psu.edu** – click Upcoming Programs & Events.

Western Pennsylvania Beekeeping Seminar

The Western Pennsylvania Beekeeping Seminar will be conducted on Friday and Saturday, Feb. 19 and 20, 2010, at the Pittsburgh Marriott North in Cranberry Township, PA. The program will begin Friday evening from 7 – 9 PM and continue on Saturday, from 8 AM – 4 PM. Presenters for the seminar include Dr. Marion Ellis, University of Nebraska entomologist; Dr. Cristina Grozinger & Dr. Nancy Ostiguy, professors at Penn State University; John McKellup, wildlife biologist and beekeeper; Craig Cella, bee inspector and bee entrepreneur; and Jon Laughner, County Extension Director & Ag Entrepreneurship Educator, and Mary Alice Gettings, Nutrition & Health Educator, both of Penn State Cooperative Extension in Beaver County. This seminar for experienced beekeepers is sponsored by Penn State Cooperative Extension, the Pennsylvania State Beekeepers Association, the Beaver Valley Area Beekeepers, and the beekeeping organizations of Western Pennsylvania. Registration fees are $45 for the primary registrant, and $20 for spouses/guests and children 18 & under. The registration fee includes an information packet (for primary registrant only) and lunch, and paid registrations are required by February 12. For more information, contact Penn State Cooperative Extension at 724-774-3003 or on the web at **http://beaver.extension.psu.edu** – click Upcoming Programs & Events.

NEW YORK

New York SABA Seminar 9-5 on March 27

Presented by the Southern Adirondack Beekeepers Association at the University of Albany.

Speakers:

Dr. Thomas Seeley of Cornell University
Dr. Marla Spivak of the University of Minnesota
Allen Hayes, EAS Master Beekeeper from Maryland

NEW YORK

HoneybeeLives Winter 2010 Organic Beekeeping

HoneybeeLives is holding their Organic Beekeeping classes with Chris Harp during winter weekends at locations in New York, including the Hudson Valley and Washington and Rockland counties. The Saturday classes are "Intro to Organic

Beekeeping: Planning a New Hive for Spring," and the Sunday classes are "Understanding and Caring For Your Bees," with dates available from late January to early March. Visit **www.HoneybeeLives.org** for dates and locations.

NEW YORK

Organic Beekeeping Workshops

For further information: 845.352.5020 x20, **info@pfeiffercenter.org**, **www.pfeiffercenter.org**

February 20, Chestnut Ridge, NY. Introduction to Organic Beekeeping, with Chris Harp. Beginners will learn the basics to get started, including a hands-on demonstration of building a wooden hive. 9 am to 5 pm, $95.

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 of caring for bees. Friday 4 pm - Saturday 6 pm, $185 ($225 with optional beginners session at 2 pm Friday).

June 26, 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.

VERMONT

Organic Beekeeping for Beginners: March 6, 2010 9am-5pm

This workshop covers what you will need to know in order to get started as a hobby beekeeper using natural and organic methods. Topics covered will include: hive construction and layout; equipment needs; choosing your apiary location; the basics of bee biology; presence and mindfulness in the bee yard; swarming as an expression of the bees' vitality; non-toxic mite and foul brood control; overwintering your bees; and an appreciation for the role that pollinators play within the Earth's ecosystem.

Presenter: Ross Conrad, author Natural Beekeeping

Location: Metta Earth Institute, 334 Geary Rd. South, Lincoln, VT 05443

Fee $40.00 -To register contact Dancing Bee Gardens: 802-545-2396 - Snacks included - Lunch may be pre-arranged through Metta Earth by calling 453-8111

MASSACHUSETTS

Spring meeting - March 27th, 2010 - Topsfield, MA Hosted by Essex County Beekeepers Association

Field Day - June 26th, 2010 - UMass Agronomy Farm, South Deerfield, MA Hosted by the Franklin CountyBeekeepers Association

Fall meeting - October 2nd 2010 - Knights of Columbus Hall, Leicester, MA Hosted by the Worcester County Beekeepers Association **http://www.massbee.org/** 508-541-6324

CONNECTICUT

On February 13, 2010, the Connecticut Beekeepers Association will host their annual Bee School. Topics will include types of equipment, installing packages and nucs, seasonal management, handling bees and more. The bee school will be held at Jones Hall at the Connecticut Agricultural Experiment Station in New Haven, CT. For more information, see **www.ctbees.com** or email us at **information@ctbees.com**

CONNECTICUT

BackYard Beekeepers Association February 23: Steve Sheppard Genetic diversity in the honey bee – consequences of colonization

On Tuesday February 23 Dr. Steve Sheppard, Thurber Chair, Department of Entomology, Washington State University, will speak about the Genetic diversity in the honey bee – consequences of colonization. This talk will cover the diversity of Old World honey bees, the establishment of bees into the Americas, the population genetic consequences of modern queen production methods and recent germplasm importations.

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 **serge boy@optonline.net** if you have any questions.

2010 BYBA General Meetings Program
March 30: Adam Finklestein, producing nucs & packages chemically free
April 27: David Tarpy, "The reproductive quality of commercial queens",
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

Monthly Workshops:
February 6: Soap Making: Marina Marchese

VIRGINIA

Northern Virginia Teaching Consortium, 2010 Beginning Beekeeping Classes

The Northern Virginia Beekeeping Teachers Consortium is offering Practical Beekeeping for Beginners consisting of weekly classes held from 7-9 pm (unless otherwise noted) late January to early April, 2010. Classes are open to adults and children (age 9 and over) who are interested in keeping bees, as well as to those who are just interested in learning about honey bees. Class Size is limited, so please register early. Teaching materials are included in the class fee of $100 (plus or minus $15 or so) and includes local club membership, Mid Atlantic Apiculture (MAAREC) Beekeeping Basics and Honey Bee Parasites Pests and Predators & Diseases, Kim Flottum's Backyard Beekeeping, as well as power point handouts and a one year membership in the local beekeeper associations. Classes are taught by EAS Master Beekeepers and experienced beekeepers

Beekeepers Association of Northern VA
(Arlington, Alexandria, and Fairfax)
Mondays beginning February 15 or 8 Wednesdays beginning February 17
Falls Church High School Cafeteria, Falls Church, VA
Contact Pat Haskell: **jim.haskell@verizon.net** (preferred) or (703) 560-3484
Open House and Registration: Feb 10

Gateway Beekeepers
(King George, Westmoreland)
8 Tuesdays beginning January 26
VA Cooperative Ext. Office, Village Center, King George, VA
Contact Julie Moore 540-644-1138, **Juliemoore@dirtybirdpottery.com**, or Mike Church 540-775-9740, **Churchmj@verizon.net**

Loudoun Beekeepers Association
(Loudoun)
8 Fridays beginning February 5 or Saturdays beginning February 6
Loudoun County Coop. Extension Office, Leesburg, VA
Contact Bill Bundy, 703-779-0894, **Loudounbee@gmail.com**
See **http://www.loudounbee.org**

Beekeepers of the Northern Shenandoah
(Clarke, Frederick, Warren)
8 Wednesdays beginning February 24 or 8 Thursdays beginning February 25
Virginia Arboretum, Boyce, VA
Contact John Lewis, Day - (540) 686-7280, Evening - (540) 931-4390

Northern Piedmont Beekeepers
(Culpeper, Rappahannock, Orange, Madi-

son, Fauquier)
8 Tuesdays beginning February 9
Verdun Adventure Bound Center, Rixeyville, VA
Open House and Registration: Feb 7, 2-4pm
Contact Mike King or Karen Hunt (540) 937-4792, **Kahu9@juno.com**

Prince William Regional Beekeepers
(Prince William, Fauquier, Stafford)
8 Thursdays beginning January 21
St. Benedict Monastery, 9535 Linton Hall Road, Bristow, VA
Contact Louise Edsall, (703) 369-0756 or **PWRBeekeepers@gmail.com**
See: **http:// www.PWRBeekeepers.com/**

Rappahannock Area Beekeepers Assoc.
(Spotsylvania, Stafford)
8 Tuesdays beginning February 2
Marshall Center, Spotsylvania Courthouse, VA, Ray Simms Room
Contact Kim Fraser, (540-785-8769), **Ubbuny@AOL.com**

Piedmont Beekeepers Association
(Lynchburg area)
8 Tuesdays beginning February 2
James River Day School, 5039 Boonsboro Rd., Lynchburg, VA
Contact Ann Zudekoff, (434-660-6063), **AnnZee@AOL.com**

Northern Neck Beekeepers
(Heathsville, Northumberland Co. area)
(8 Mondays beginning January 25)
Northumberland Public Library, 7204 Northumberland Highway, Heathsville VA 22473
Contact Matt Lewis, Northumberland Extension Office, (840-580-5694), or Jim Schmalz, (804) 580-2071, **jaschmalz@Juno.com**

ALABAMA

Auburn University's 14th Annual Beekeeping Symposium

Auburn University, Alabama Extension System will hold their ***14th Annual Beekeeping Symposium on Saturday, Feb. 6, 2010,*** at the Auburn University, Lowder Building, College of Business, 415 West Magnolia Ave., Auburn University, AL.

Keynote speaker is: Dr. James E. Tew, OSU/AU Alabama Extension System, Apiculture Specialist. Some other speakers include Phillip Carter, Sallie Lee, Bill Mullins, Buddy Adamson, and Dennis Barclift.

There will be a wide range of topics which include "Raising & Replacing Queens", "Urban Beekeeping", "Planting and Gardening for Bees", along with a Basic Beekeeping track for those interested in becoming and new beekeepers.

Registration starts at 8:00 a.m. to 8:45 a.m. with the program starting at 8:45 a.m. until 3:45 p.m. Lunch will be provided by the Alabama Beekeepers Association. The registration fee for the day is $17.00. For more information contact Angie Rodgers at 334-844-5006 or e-mail: rodgeas @auburn.edu or Sherry Ferrell at 330-263-3684 or e-mail: ferrell.6@osu.edu

FLORIDA

North Escambia Bee Association (NEBA)will be sponsoring their annual Chautauqua at Northview High School in Bratt, Florida on Feb. 20, 2010. Dr. Lila De Guzman, entomologist, USDA Lab, Baton Rouge, LA will be the featured speaker along with several more speakers. Pre-registration Fees: $30 couple, $25 per person, $12.50 school students (12 & up), children 0-11 free. Registration at the door $5.00 extra per person. Pre-registration must be postmarked no later than Feb. 12, 2010. Food will be supplied by the Northview FFA. Contact info: Pauline Miller 850-476-3220 or Diana Miller 850-968-2676.

FLORIDA

What - Southeast Organic Beekeepers Conference
When - Feb. 6 and 7, 2010 8 a.m. - 5:30 p.m.
Where - Mounts Botanical Garden, 531 N. Military Trail West Palm Beach, FL 33415
Who - Palm Beach County Beekeepers Association
For more info **http://seobc.beekeeperspbc.com** or call 561-247-5304

ST. CROIX, VIRGIN ISLANDS

Queen Rearing Class

A three-day queen rearing course will be offered February 19, 20 and 21 on St. Croix in the Virgin Islands. Dr. Lawrence connor is the instructor. There is a very limited number of spaces open for this course. For a fact sheet that includes fees, housing options and course details, go to the **www.wicwas.com** website, or email Dr. Connor at **LJConnor@aol.com**

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World Honey Market

UNITED STATES

For many commercial beekeepers February and the beginning of the almond pollination season in California are probably just as if not more important than the honey production months of May, June and July. Most migratory beekeepers had already placed their colonies in holding yards in the state, but will be moving them to the almond groves soon. Although prices are down by $10 or more this year, the incentive is still there to make the trek to California. With poor honey crops in 2009, a number of commercial beekeepers felt they needed to again place their bets on almond pollination contracts. Overwintering success, as well as grading of colonies, are still two big unknowns, however.

Winter came on strong over much of the country by the end of December. Large snowfalls and bitterly cold temperatures gripped the northern half of the country in early January. However, the biggest immediate concern for many beekeepers was how the cold weather and frosts were affecting the Southeast and orange groves in Florida. Not only can fruit be ruined, but trees can be damaged, as well as the orange flow bloom. Other early buildup flows in the Southeast can also be damaged by prolonged cold spells and freezes. These early flows are especially important for package bee and queen breeders who count on them for buildup in order to fill their many bee orders from around the country. Earlier reports of fall colony losses were mixed, with some producers suffering heavy losses, while others felt that their colonies were going into winter with strong bee populations. As far as winter losses are concerned, many beekeepers will not have a good estimate until they are able to check colonies after the first cleansing flights this month and next month.

All areas are reporting excellent wholesale and retail honey sales. Unfortunately, due to another very poor honey crop—perhaps a record poor year in 2009—few beekeepers have much honey still available unsold. Wholesale prices of $1.50 to $1.60 are common. And, in at least one instance, a midwestern beekeeper has sold small lots of white honey for $2.00 per pound and we have heard that $1.75 per pound is not that uncommon with amber prices averaging 5 to 10 cents below this.

Unfortunately, although domestic honey prices are up, this scarcity of honey is opening the door to honey blends, as well as more cheap Chinese honey shipped via third-party countries to avoid the U.S. tariff on Chinese honey. The trend toward honey blends is particularly disturbing since this product is being legally labeled as a blend and is being offered as a lower priced alternative to pure honey in stores and to industrial users.

NORTHEAST—After a mild fall, winter came on with a vengeance in the northeast bringing heavy snowfall and bitterly cold temperatures. Colonies that went into winter with sufficient stores should be fine, but some beekeepers who normally rely on fall flows for all of their winter stores will need to watch colonies closely during late February and early March when cleansing flights take place.

Beekeepers are generally satifified with the prices that they are receiving for their honey at both the wholesale and retail levels. Unfortunately, many of the higher prices being received are due to the scarcity of locally produced honey. Many beekeepers produced poor honey crops and sold most of their surplus last fall. Another downside is that the honey scarcity and higher prices are causing more packers to turn to imported honey or worse yet, honey/syrup blends.

MIDEAST—Reports are varying on colony strength and condition. Some reporters felt that their bees went into winter strong with good populations and stores. On the other hand, due to poor honey crops, other reporters suggest the exact opposite—that their colonies went into winter with smaller than normal clusters and below normal winter stores. Beekeepers will definitely need to check colonies as early as they can to start feeding where necessary. The early winter brought heavy snows and windy, cold weather. However, this should not be a problem unless colonies were already short on honey stores. One nice result of the rainy summer, fall and early heavy snows is that ground moisture conditions are back to normal in many locations that have suffered from a lack of water for a few years.

As in the Northeast, a severe shortage of locally produced honey has brought record prices, but many beekeepers simply did not have enough surplus to take advantage of the strong market. As always in these situations, this has opened the door to both importers of cheap honey and honey adulterators.

SOUTHEAST—As this was written in early January, the major beekeeper concern in Florida was damaging Arctic blasts of cold air. These cold blasts not only threaten the citrus crop, but also damage citrus trees and curtail bloom. This can be devastating to beekeepers who rely on the orange groves and other citrus acreage for a major portion of their honey crop. By our next report, we should know if this precarious situation did, indeed, damage orange honey prospects. The severe cold weather can also damage other honey plants and trees or curtail their bloom since major honey flows come much earlier in this region of the country.

Ground moisture conditions are rated as satisfactory to dry over much of this area. Southwest Florida reporters said dry weather was a major concern in their area. Beekeepers were hoping for warmer weather, along with seasonal rainfall to help soil moisture for plant growth.

With another season of below normal honey crops over much of the Southeast, inventories of surplus honey are beginning to dry up. Wholesale prices have risen, but this is of little solace to those who did not produce enough honey to meet rising costs of production. Some beekeepers are attempting to sell more of their crop at the retail level and there is a growing trend among consumers to purchase locally produced and packaged foods such as honey. In fact, some beekeepers have commented that they have been able to sell some of their darker grades formally regarded as "bakery grade" by packers to an eager group of health-conscious consumers. This, of course, requires considerably more effort since the honey must be bottled and marketed, both of which take much more time than simply filling honey barrels and taking them to a packer.

Package bee and queen producers have been gearing up for another busy season. Early orders were already starting in January and February as beekeepers tried to lock in their shipping dates before anticipated supplies of bees and queens were booked up.

SOUTHWEST—Reporters said that they have been having cooler than normal temperatures and above normal moisture. While the added moisture will help spring plant growth,

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	$70.00-$98.00	$60.00-$80.00	$65.00-$82.00	$65.00-$85.00	$65.00-$87.00	$60.00-$83.00	$65.00-$85.00	$62.00-$88.00
2 lb. CS 12	$69.00-$75.00	$65.00-$78.00	$60.00 $75.00	$60.00-$75.00	$59.00-$75.00	$58.00-$75.00	$60.00-$85.00	$55.00-$78.00
5 lb. CS 6	$75.00-$90.00	$65.00-$75.00	$60.00-$72.00	$72.00-$78.00	$70.00-$75.00	$73.00 $80.00	$72.00-$85.00	$75.00-$85.00
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 1 1/2 lb. (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.	$2.10-$3.50	$2.10-$2.75	$2.10-$3.00	$2.10-$2.50	$2.10-$2.50	$2.10-$2.50	$2.10-$2.50	$2.10-$2.50
Dark per lb.	$1.95-$3.00	$1.95-$2.35	$1.95-$2.25	$1.95-$2.25	$1.95-$2.25	$1.95-$2.25	$1.95-$2.25	$2.05-$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.

some beekeepers said that the cool, wet weather had been slowing brood production and colony growth at a time when beekeepers need strong colonies in order to make later splits or nucs. In late December and early January, several states in the area reported major winter snowstorms with significant accumulation. At this point, colonies were still wintering okay, but if the cold weather continues much beyond normal into the new season, beekeepers will be forced to feed extra syrup or face colony starvation. Early maple, willow and other trees should start providing early pollen and nectar this month.

Beekeeper and packer honey inventories remain low and prices have continued to increase at both the wholesale and retail levels for remaining stocks of 2009 honey. More honey/syrup blends are showing up on the grocery store shelves, which is a major beekeeper concern.

EAST CENTRAL—Since last month, winter weather has stopped all outside bee work. In addition, migratory beekeepers from this area are either in California for almond pollination or have moved many colonies to the South for buildup. Several winter storms passed through the area in late December and January bringing large snowfalls and subsequent very cold temperatures. Beekeepers in heavy snowfall locations say that the snow will help with colony insulation against the unusually cold temperatures accompanied by strong winds. Since honey crops were poor over much of the East Central area, a number of beekeepers fed their bees last fall and will need to keep a watch on them after the first cleansing flights occur in February or March.

As in much of the rest of the country, honey supplies remain short, but wholesale and retail demand continue to be strong. Beekeepers report receiving more calls from packers looking for honey. We received one of our first reports of $2.00 per pound being offered by a packer for nonvarietal white honey. This was for a load of about 10 barrels of honey. Retail honey sales continued strong through the holiday season, but supplies are now running low. A major concern continues to be cheap Chinese "funny honey" shipped to the U.S. via third-party countries, as well as the increasing use of honey/syrup blends by packers for both their industrial and consumer sales. Wisconsin beekeepers are in the final stages of getting a honey identity law passed in their state.

WEST CENTRAL—Varroa mites were very active this fall in the upper Midwest, according to a number of our reporters. As a result, a fairly large number of beekeepers will need to restock a large percentage of deadouts this spring. This means taking survivors to the South for buildup and making splits or buying package bees or nucs from a breeder. Other beekeepers report that after feeding this last fall, their colonies went into winter in good to excellent shape with nice large clusters. Of course, migratory beekeepers have already moved their colonies to California for almond pollination. Prices being offered this year on colonies with eight frames of brood are varying from $130 to $140.

Before the late December and January snowstorms, some reporters were saying that ground moisture was getting a bit short. However, the heavy snowfall should help this situation. Bitterly cold temperatures have accompanied the storms, so beekeepers have not been able to check colonies, but will start to do so during the first cleansing flights in February and March.

Both wholesale and retail honey sales have remained strong through the first half of winter. We have heard of $1.75 for white and $1.60 per pound for amber on smaller wholesale lots sold. On larger lots, we are still hearing of $1.50 to $1.55 for white and $1.45 to $1.50 for amber grades of honey. Local honey continues to sell well at Farmers' markets, health food stores and grocery stores.

INTERMOUNTAIN—After enjoying a rather mild fall, cold weather and snow came to much of this area in late December and January, stopping all further bee work. Most migratory colonies had already been moved to California or southern states. Colonies left on locations were medicated, fed and winter packed to insulate them from the cold. Beekeepers will start checking colonies in March and April during the first cleansing flights. Many beekeepers felt their colonies went into winter in good shape, although a few mentioned heavier than normal varroa mite loads. Several reporters said that they were making an effort to switch to mite-resistant queens in 2010.

Retail sales were strong throughout the fall and holiday season, but some beekeepers are

running out of honey now. Wholesale prices have increased as packers have come to realize how short the U.S. honey crop was in 2009.

WEST—The 2010 almond pollination season is off and running in California. Actually, the season started for many beekeepers in the late summer and fall of 2009 when they began medication and feeding in preparation for the 2010 season. Although contract prices are down by an average of $10 per strong colony, the incentive was still there for most beekeepers to return to California for this season. Despite the fact that wholesale honey prices have been increasing, many beekeepers had disastrous honey crops last year and need the infusion of pollination cash for their operations to continue. Some growers have cut back on their need for colonies due to water shortages and lower almond prices. This has resulted in prices being negotiated even lower as remaining beekeepers without contracts compete for the last uncommitted almond groves. Some reporters have wondered out loud that it would really be ironic if after the shuffle, many colonies succumbed to mites or starvation over winter and a colony shortage actually developed!

As far as honey crops are concerned, beekeepers have been watching the weather to see which locations are getting the best rains or snowfall. Several storm fronts have moved through the western U.S., but some locations received little or no rain from them. The best moisture conditions were in Washington, Oregon and northern California. Early nectar and pollen sources will be starting soon in the southern half of California. Many beekeepers count on building up their bees on almonds and other early sources before moving them to favorable clover and alfalfa honey production locations out-of-state.

As in the rest of the country, both the wholesale and retail markets for locally produced honey are stronger, but supply is short.

CANADA

Canadian honey production in 2009 was 64.8 million pounds, comparable to the 2008 levels of 64.9 million pounds. The national average revealed a small decrease in yield from 116 pounds of honey per colony in 2008 to 115 pounds in 2009. Correspondingly, across the provinces, production and yields remained virtually unchanged from 2008 levels. Over 80% of honey production is generated from the Prairie Provinces, with Alberta continuing to be the leading honey-producing province. Some factors affecting honey production are the weather, the amount of nectar available and presence of disease or mites.

There were 200 fewer beekeepers across Canada with 6,728 people engaged in commercial beekeeping activity in 2009. The number of managed hives was 576,000, 5,600 more than in 2008.

The total value of honey is available from the previous season. Total value of honey in 2008 was $105.2 million, an increase of $20.3 million, or 23.9%, over the 2007 value of $84.9 million. *(Courtesy Statistics Canada)*

ARGENTINA

As of Dec. 30, 2009 total Argentine exports reported by the local Customs Office show that just 52,000 MT of honey were exported for US$145 million, equivalent to US$2,781 per metric ton. Although this number may change slightly by a few unrecorded exports, it is considered that this tonnage will not increase significantly. This volume is also the lowest on record since 1993 (55,000 MT) and it represents only 50% of what was exported during 2005 (105,000 MT). These numbers show the dramatic decline of Argentine beekeeping, once regarded as one of the largest world exporters of honey.

Exports during 2009 were mainly shipped to Germany (24,370 MT), the USA (11,060 MT), Italy (4,100 MT), France (3,500 MT), the UK (2,340 MT) and several other minor destinations. Surprisingly, during the last quarter of year 2009, shipments to both Germany and the USA were almost the same (3,000 MT for each country) in spite of the unfavorable exchange rate for American buyers between the EURO and the USD. Interestingly, the top five Argentine exporters shipped over 60% of the total volume. This list includes in the first three places the following companies: ACA (11,575 MT), NEXCO (9,352 MT) and HONEYMAX (3,152 MT).

The outlook for the new honey crop, which started by late November 2009 and is supposed to finish by late February 2010, is not very optimistic at this stage. Although most beekeeping regions in Argentina were blessed with good rains during November and December 2009, these showers were excessive and even created flood conditions in many provinces. Temperatures during December 2009 were the lowest in many years so nectar production was much lower than expected. The big guess will be the impact of the *el niño* weather pattern on honey plants during January and February 2010 in the Argentine prairies. So far, only a handful of beekeepers located in the provinces of Entre Ríos, Santa Fe and Buenos Aires will enjoy good honey crops for sure.

The acreage of soybeans is again very high this year. Although not all of the plots have been planted yet, over 18 million hectares are at least expected. The current soybean varieties in Argentina are unfortunately non-nectar producers, so beekeepers who largely depend on sunflower commercial crops are very upset, because the acreage of this plant in 2009 only reached 1.3 million hectares, which is 44% less acreage than 2008 and quite similar to the acreage planted during 1974 (1.2 million hectares)!

Exporters complain about the big challenge to collect full container loads given the diminishing number of commercial beekeepers. Logistics and transportation charges become a big burden for those exporters who pretend to keep their existing market share.

2009 Canadian Honey Production

	Beekeepers [1]	Colonies [1]	Honey: Production of honey, total [2]	Honey: Production of honey, total [2]	Honey: Value of honey, total [2]
	number		thousands of pounds	metric tonnes	thousands of dollars
Canada [4]					
Average 2004 to 2008	**7,567**	**600,231**	**79,190**	**35,934**	**97,160**
2008	**6,931** r	**570,870** r	**64,895** r	**29,444** r	**105,184**
2009 p	**6,728**	**575,676**	**64,788**	**29,396**	..
Prince Edward Island					
Average 2004 to 2008	22	2,452	139	63	286
2008	24 r	4,000 r	260 r	118 r	520
2009 p	28	3,530	265	120	530
Nova Scotia					
Average 2004 to 2008	294	18,880	629	285	1,128
2008	210 r	19,200 r	392 r	178 r	784
2009 p	200	19,500	420	191	840
New Brunswick					
Average 2004 to 2008	218	5,108	203	92	289
2008	187 r	3,000 r	174 r	79 r	348
2009 p	180	2,700	189	86	378
Quebec					
Average 2004 to 2008	247	32,845	2,956	1,341	6,551
2008	256 r	36,123 r	3,186 r	1,446 r	8,527
2009 p	250	35,000	2,100	953	..
Ontario					
Average 2004 to 2008	2,430	76,280	7,080	3,212	11,746
2008	2,200	80,000	4,586 r	2,081 r	9,190
2009 p	2,150	81,200	4,571	2,074	..
Manitoba					
Average 2004 to 2008	594	80,635	13,510	6,130	14,681
2008	523 r	75,173 r	12,028 r	5,457 r	17,440
2009 p	474	70,746	12,310	5,585	..
Saskatchewan					
Average 2004 to 2008	1,056	97,000	18,237	8,275	21,222
2008	1,045	90,000 r	16,560 r	7,514 r	24,840
2009 p	971	85,000	17,000	7,713	..
Alberta					
Average 2004 to 2008	700	243,200	33,399	15,154	39,128
2008	620 r	226,000 r	25,990 r	11,792 r	37,755
2009 p	625	240,000	25,920	11,760	44,865
British Columbia					
Average 2004 to 2008	2,006	43,832	3,047	1,382	8,094
2008	1,866	36,574	1,719 r	780 r	5,779
2009 p	1,850	38,000	2,014	914	7,544

1. Beekeeper and colony numbers include pollinators that may not extract honey.
2. Production excludes inventory.
3. Value excludes inventory sales except for in Québec.
4. Does not include Newfoundland and Labrador.
Note(s): Figures are compiled by Statistics Canada from provincial data, except for New Brunswick and Prince Edward Island where data are collected through a Statistics Canada mail survey.

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SAMUEL WAGNER

The First Editor of the *American Bee Journal**

by KENT L. PELLETT*

A. I. Root decided to publish a "Beekeepers' Medley." This ebullient beekeeping innovator always was afoot with something novel; now he published on a large mounting the faces of beekeepers he considered worthy of note, arranging them according to his own lights, a hundred of the great and near-great, a medley of the faces which had become distinct from the mass of their fellows.

The portraits of the best known of his day were there: Quinby, Newman, Grimm, Langstroth, Hetherington, the Dadants, Cook, Doolittle, and others. One face however, was missing, one who had stayed in the background, aloof from the pushing throng who were casting American beekeeping, yet vitally a part of them—the face of Samuel Wagner, the first editor of the *American Bee Journal*.

Aloof he may have been, and reserved, yet the old German's cool pen had guided his brothers clear of rocks during the first years of American beekeeping, and his portrait should not have been left out of the Medley.

But Root could not find a portrait of him. Friends told him that Wagner had shrunk from the eye of the camera, had never allowed his likeness to be taken. Root turned to Father Langstroth. He and Wagner had been good friends; perhaps he could find a way out of the difficulty.

Langstroth knew of no photograph of Wagner, but he did know of a man who was Wagner's counterpart. Their best friends often had confused the two when Wagner had been living. This man's picture he sent to Root, who included it in the gallery. Thus by proxy Editor Wagner was placed among the lights of beekeeperdom.

Samuel Wagner was born two years before the break of the nineteenth century. His father was pastor of the German Reformed Church at York, Pennsylvania, and Sam was ten years old before he began to learn the English language. But he made good use of the years spent at the parochial school and at the York County Academy, and at 26 he was able to buy the *York Recorder* and begin his career as an editor.

But, in the course of a few years, for reasons which his biographers have failed to tell—chroniclers are forever overlooking the vital points of a man's life story, in their zeal to record the places where he lived and the years he lived there—Wagner forsook journalism and became cashier of a York bank. This position he held until his later sixties, when he became for five years the disbursing officer of the Senate.

His hobby was bees. Believing that there were enough beekeepers in the United States to support an apicultural magazine, in 1861 he began the publication of a plain little sheet which he called the *American Bee Journal*. But bee men, scattered and not yet inured to the rigors of book learning, supported very poorly the first American bee magazine. Then came the first claps of the Civil War. They grew louder, and Wagner discontinued the little paper after only one year.

But the war, which cut off the supply of southern sugar from the North, caused the price of sweets to rocket, and housewives demanded honey. Bees became a subject of more general interest, and after the war, at the request of his friends, Wagner again opened his columns of the *American Bee Journal*. This time the venture was a success and he continued to edit the magazine until his death, six years later.

These were the outward milestones in the life of Samuel Wagner—editor of a country newspaper, cashier of a bank, disburser of the Senate, editor of a small bee magazine—prosaic, no doubt; and only a few of his closer friends knew the richness of his inner milestones and the extent and variety of his knowledge, half hid by a reticent personality.

Since Samuel Wagner did not want to have his picture taken, this look-alike man's photo was used in Root's Beekeepers' Medley that featured 100 famous beekeepers of the 19th Century.

He was well acquainted with American history, with the history of his church; when he had become interested in bees, he had taken care to learn as much of beekeeping literature and history, and acquired the best library of German beekeeping literature then in America. He subscribed to the *Nordlinger Bienenzeitung*, the German bee magazine, with the first issue, and kept a complete file of the magazine.

During the late 1840's a fracas was raised in the pages of the *Bienenzeitung*. Dzierzon had advanced his theory of parthenogenesis and was engaged in controversy with the naturalists and theorists of various sorts whose pet hypotheses he had upset. Wagner followed the stubborn battlings of the German parish priest with interest, and ordered his book, "The Theory and Practice of Bee Culture." He perused it carefully and was soon convinced that Dzierzon's system of movable comb beekeeping was better than box-hive beekeeping practiced in America. He decided to translate the book into English, and in this way to spread the advanced Dzierzon methods among the American farmers.

Several months were spent in translation,

Originally published in October 1929 *American Bee Journal

In Defense of Langstroth's Hive

(From March 1872 *American Bee Journal*) by Samuel Wagner

The following communication comes to us alike unexpectedly and unsolicited, and yet comes quite opportunely. In the article concocted by H.A. King, which was given in the last number of the *Journal*, that veracious and fair-dealing dealer in worthless patents refers to the book of Mr. Debeauvoys and says the author therein "describes moveable frames *containing all the features of the most perfect frames* now used in this country." If, before writing these words, King even saw and examined the Debeauvoys hive, or read a correct description of it and its frames, he must have known that he deliberately penned a gross misrepresentation, for the purpose of deceiving and misleading his readers. The Debeauvoys frames lack the essential features of the most perfect frames now used in this country, and for that very reason proved to be a failure in practice, so decided and irremediable that, after full trial they were rejected and abandoned. Perhaps, after reading Mr. Dadant's description of the hive and his account of its fate in France, King may begin to suspect that his efforts at deception have not been quite as successful, in this instance, as he hoped they would. He is doomed to yet other equally overwhelming and mortifying disappointments.

Honor to whom Honor is due. by Charles Dadant

In the patent hive contest which arose between Mr. Langstroth and Mr. H. King, I have no more wish to give my opinion than I have the desire of supporting either side. However, I think it is my duty to tell what the Debeauvoys hive was when the first two editions of Debeauvoys book were published. I had those two editions (1844-1847) in my possession, and manufactured hives with their directions, for my own use.

The frames of the Debeauvoys hive were as broad as the interior of the hive, *i.e.*, close-fitting at the sides, and supported in the hive by two strips of wood nailed inside of the hive and at the distance of 3/8 of an inch from the bottom.

The hive had its roof slanting and nailed. The bottom was movable. The two sides were movable doors, through which the frames could be taken out. These doors, being of the same size as the frames, could be pushed in the hive to contract the space. They were held in place with hooks. The frames were kept apart by nails driven in them at each side.

The hive worked well when new and empty; but after the bees had glued the frames, it was difficult to remove them, without breaking the combs.

It would have been entirely impossible to remove them at all, without separating the ends of the hive from the frames with a chisel.

This hive, which has gained 2,500 proselytes in France, was very soon abandoned by all; and the disciples of Debeauvoys returned to the old-fashioned straw hive. (*Vide L'Apculteur*, Paris, Fevrier 1869.)

The inventions of Debeauvoys were disastrous for French bee-culture. The tenacity with which the majority of French beekeepers hold fast today to the old system, is due to the defects of the movable frame hives that they tried at first, "Chien échaudé craint l'eau fivide."*

The Berlepsch hive is not much better than the Debeauvoys hive, if we are to believe what M.M. Bastian and Mona say of it.

Mr. Bastian writes in his book, "Les Abeilles," Paris, 1868, page 148, "The Berlepsch hive cost from 15 to 20 francs; besides it has to be built of very exact dimensions, for the slightest varying prevents the frames from fitting in it."

On the other hand, Mr. Mona writes in the Italian Bee Journal, "*L'Apicoltore* (Milan, July, 1871), page 205, whatever have been the defects of my hive and methods, four years ago, I am not responsible, if they were not superior to the level of bee culture in Europe. This verical hive (Berlepsch fashion) with 24 frames *arcipropolisabili*, placed on top of the other, with diaphragms and small comb covers, with insufficient ventilation, and other *delizie*, was soon replaced by another system, that was altogether easier, cheaper, better, and more productive."

In the "*Journal des Fermes*," Paris, August 16th, 1869, page 324, Mr. Mona writes—"An American beekeeper, Mr. A. Grimm, visited me in September, 1867. He advised me to adopt the American form of hive (Langstroth's), which he himself used on a large scale. He asked for some boards, some nails, and a few tools, and after a short time he presented to me a pattern of his hive. I found the length of the frames disproportionate, but I soon recognized the advantage of the movable cover, and after a few weeks of hesitation, I resolved to make a hundred hives of the same kind, with shorter frames. I used them for the last two years, and I acknowledge that they are very useful for me, the handling of the frames being very speedy."

The reader will notice that the date of the construction of these hives is in accordance with the four years of which Mr. Mona speaks in *"L'Apicoltore"*.

It appears from the above that while the disciples of Debeauvoys in France abandoned his hive, and the disciples of Berlepsch and Berlepsch himself groped to improve their own hive, L. Langstroth gave to the American beekeepers an easily constructed and easily managed hive, which, from the beginning until now, rendered the best services to bee-culture.

I do not know whether these facts can have any influence on the lawsuit now pending, but I owed to Mr. L. Langstroth, I owed to truth, I owed to the history of bee-culture, the publication of the above facts.

I send one copy of this to each of three American bee journals. They will publish it, if they think proper.

CH. DADANT.

Hamilton, Ills., January, 1872

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* *"A scalded dog dreads even cold water"*

and when the manuscript was completed, he loaned it to the Rev. Berg, of Philadelphia, another beekeeping devotee. Berg was impressed and urged Wagner to publish the manuscript at once.

Berg was not acquainted with German beekeeping, but he read desultory contributions by Americans in the farm magazines. He found interesting the writings of a certain Rev. Langstroth, who displayed a knowledge and an understanding of bee behavior beyond the ordinary. Berg decided to visit him in his West Philadelphia home.

Berg found Langstroth in his apiary, and was surprised, for he was using a bar hive, and seemed acquainted with many of the practices of Dzierzon, although he never had heard of the the churchman. He had worked out a system of beekeeping better than any Berg had believed to exist in America. Berg told Langstroth of Wagner and the Dzierzon book which he had translated, which he sent to Langstroth upon reaching home.

Langstroth was soon writing to Samuel Wagner and telling him of his amazement that another had preceded him in discoveries he had thought his own. Yet, he believed his hive had points of superiority. He invited Wagner to come and see him. Wagner found the Philadelphia clergyman a charming correspondent and decided to accept his invitation.

Langstroth was not at home when Wagner arrived; but in his absence Wagner explored the apiary thoroughly, opening and examining the clergyman's peculiar hives. Now it was Wagner who was amazed. Here were put in practice principles of the book he had taken months to translate. Here were the movable combs that Dzierzon advocated. But the details of operation were different and the hives of the two masters did not at all resemble each other in appearance. Wagner admitted to himself as he glanced through the hives and handled the combs

that here was a perfection and simplicity that Dzierzon himself had not attained.

As he went home, he looked into the future of American beekeeping. He had dreamed of becoming the benefactor of American bee men, of helping them to better their practice by publishing the book of Dzierzon, but now be happily put that dream aside. Langstroth with his movable frames had gone beyond Dzierzon—he should be the prophet of the new beekeeping.

He urged Langstroth to write a text on beekeeping and publish his discovery for the world. It was what Langstroth had in mind, and within a few months he was in a fever of work preparing his manuscript. It was published, and Langstroth's system slowly captured America. Wagner tucked his manuscript away in a drawer, where it remained; and later, when the first translation of Dzierzon's "Theory and Practice of Bee Culture" was given to the American beekeepers, it was done by a hand other than that of Samuel Wagner.

Wagner and Langstroth became the best of friends, and together undertook several ventures. Wagner, becoming interested in the success of the Germans with the Italian bees, in 1856 had ordered some of the yellow bees shipped to him; but the mate on the boat had proved a hungry fellow and had stolen all the honey, leaving the bees to starve before they reached New York. Three years later Wagner and Langstroth, with a man named Colvin, made another attempt to import the Italians. But by that time others had seen their possibilities. Parsons was importing some stocks for the United States Government, and P.J. Mahan also was making the attempt. The three cargoes of bees all were on the same ship. There was haste as the ship docked. Who would have the honor of landing the first Italian bees on American soil? A hive belonging to Parsons was smashed as it was thrown to the dock. The captain of the boat walked ashore with one of the hives of Wagner, Langstroth, and Colvin, and proclaimed the bees the first Italians to reach America. The honor remained a mooted one. All parties claimed it.

Langstroth often wrote for the *American Bee Journal*. Where could have been found a better team for the establishment of the first American bee magazine than the inventor of the movable frames and the scholarly old German, who was versed in the pages of the past, yet followed closely the developments that were treading on each other's heels in the turbulent day? The *American Bee Journal*, in those first years when Wagner's calm and restrained hand guided it, was a model of apicultural scholarship, of careful editing. Wagner barred from its columns the contentions and disputes that were for years to fill the pages of the later magazines.

His chief fault, perhaps, for representing the times, was that he was too much the scholar, restrained in a period when everybody was excited and when rural people had little time for the niceties of book learning, but loved nothing so much as a battle of wits or of words. Wagner held himself aloof. Other editors contended for special systems and punched the editorial notes of their rivals.

The old *American Bee Journal* may have been quiet and dignified in tone, but in its pages were chronicled the happenings of the most significant years of American beekeeping. There appeared the evidence for the Dzierzon theory of parthenogenesis, the first record of the sight of a mating of a queen and drone, and the story of the invention of the honey extractor, with a picture showing its construction. In its columns were printed the minutes of the first convention of American beekeepers, the record of the successful propagation of the Italian bees in the United States, the story of the growing popularity of the Langstroth system.

In Wagner's last days, however, one severe controversy racked the *Journal*. When, after H.A. King had for years openly sold hives infringing on his patent, Langstroth brought suit against King. Wagner considered the case of so much importance that he opened his columns to all the evidence that might be offered by both parties. King went to Europe searching for proof that Langstroth was not the true inventor of the movable-frame hives, and came back with statements of leading Europeans which seemed to prove their priority as inventors.

Wagner printed King's evidence, with refuting statements by Langstroth. He also printed a letter from Charles Dadant. Dadant had worked with the movable-frame hives invented by the Europeans prior to the Langstroth hive, and he wrote that they were impractical compared to the Langstroth hive. Wagner sent the letter to be printed in the *Journal*, with a few words of his own appended. "King may begin to suspect," he wrote, "that his efforts at deception have not been quite as successful, in this instance, as he hoped they would."

He laid aside his pen. These words, the first harsh words he had written for the *Journal*, were also the last which ever appeared in print over his name, as a few mornings later he died suddenly.

It was a fortnight before King felt, through the *American Bee Journal*, the rebuke of Samuel Wagner.

Next month—American Bee Journal editors W.F. Clarke and Ellen S. Tupper

The Home of the Honey Bee Has Changed Over Time

by G. H. Cale*

Honey bees existed millions of years before man appeared on earth. When man accumulated enough wisdom to appeciate the food value of honey and later the value of beeswax, he began a search for some way to control the abode of the bee to suit his needs. Bees in nature lived in trees, caves, rock holes, under overhangs, around places where man lived.

Probably because of the lack of easy living quarters, the honey bee was not widely distributed. Then, when man provided the first simple "hive" the population of honey bees slowly increased. Early hives were no more than crude shelters like the Egyptian mud hive, which have been in use for many centuries. Many early hives were made of straw. Some had wooden bars provided on which combs were built. The Greeks, centuries ago, used slats or bars so the combs could be cut loose, and lifted out separately.

These bar hives were later used in various kinds of wooden construction and the combs, when cut loose, were removed on their bars either from the top or the sides, or the ends of the hive. There were even provisions for adding parts, so the colony could be extended upwards as we can do today. These bar hives persisted to the time of Dzierzon (who discovered that unfertile eggs produced drones and fertile eggs produced workers).

Before the day of the Langstroth hive, there were frames in use. The Huber leaf hive had frames of uniform size all the way around, with hinged end bars at one side. This hive gave the blind naturalist a chance to find and explain many previously unknown facts about how bees live and work.

The Debeauvoy hive employed frames that fit perfectly in the hive, but they were not movable. Berlepsch used spaces around frames, but provided no top opening so the comb had to be drawn out through a back door. The Stewarton hive had frames, but they were not freely removable, yet this hive came close to being like Langstroth's.

It remained for the Rev. Lorenzo Lorraine Langstroth, in 1851, to discover the "bee space" (about 5/16 of an inch surrounding the combs and hive parts). Bees respect this space and they will not attach combs or parts or build between when this space is maintained. Langstroth had made a miraculous discovery.

Quickly he shaped a hive of boards from the lumber yard (which probably gave rise to the size of the original Langstroth hive) and made wooden frames to fill with combs to set in the hive. The bees respected at once his use of the bee space. The modern hive was born.

Langstroth patented his hive and the patent lasted until 1873. During those years many others made hives using the Langstroth principle, often in violation of his patent, resulting in considerable litigation. Up to 1900, hive discussion was frequent, often violent and abusive. Claims of perfection in the hive construction were numerous. There was an avalanche of hives:

An outdoor colony with no winter shelter. Colonies like this seldom survive long, cold northern winters.

***G. H. Cale, former *American Bee Journal* editor. Article first published in 1956 *ABJ*.**

Straw skeps in a bee garden used to house bees before Langstroth's discovery of the bee space and the movable comb hive.

the American, Cottage, Continental, Hicks, Kidder, Mitchell, Prince Arthur, Armstrong, Oatman, Gallup, North Star, Bay State, Adair, Triumph, Conklin Diamond, and many others.

All the considerations given to hive sizes were based on a single hive for the complete brood requirements of the colony. There were two schools of thinking; those who clung to the original size of the Langstroth hive and those who thought hives should be larger or smaller than the original Langstroth. Among those following the advocates of small (divisible brood chamber hives) were James Heddon and Danzenbaker. Quite a few beekeepers today still use the shallow or divided brood chamber and have learned how to manage it and to develop a plan to which this style of hive is adapted.

Probably the greatest separation in thought was between those who considered the single Langstroth hive sufficient in size and those who thought it was too small. The most famous advocates of a hive larger than the Langstroth were Moses Quinby and Charles and C.P. Dadant. They contended that the Langstroth hive was too small for the egg-laying capacity of a good queen in a single hive body. During this period of dispute, the large Dadant hive evolved and for many years it was used as a standard hive for brood rearing purposes in many parts of the world.

In conducting his experiments with hive size, Charles Dadant, in 1869, said, "The capacity of the hive should be proportional to the fecundity of the queen." So the Dadant hive was based on numerous observations of the laying ability of the queens of that day, with the object of providing a hive large enough for the brood of the best queen in a single hive body.

One of the determining influences on hive size was the difference in management between the early era of comb honey production and the later one of extracted honey production. Extracted honey did not become common until after the passage of pure food laws which assured the public of a pure product.

Comb honey production demanded a small, easily handled hive so the bees could be forced into comb honey sections. On the other hand, the extracted honey producer needed a hive of much greater capacity for the storage of the largest possible crop of honey to be extracted.

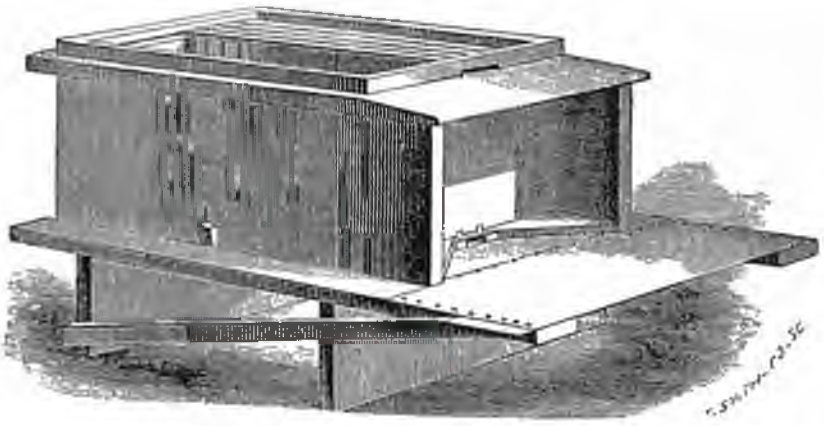
In 1896, Doolittle said that the majority of successful comb honey producers were using small hives. Previously, in 1883, Newman declared that there were more divisble Langstroth frame hives in use than all others put together. In 1878, James Heddon (later to join the ranks of shallow hive advocates) said it was his prediction that the 8-frame Langstroth hive would be the only hive used by the specialist beekeeper in a few years.

The result of 75 years of discussion and of trial and error led to the use of either the 8-frame Langstroth or the 10-frame Langstroth or the large Dadant hive. The so-called Modified Dadant hive was devised by Frank C. Pellett, with frames the length of the Langstroth, but the depth of the old-style Dadant and the earlier Quinby.

Also, the discussion which had prevailed for so many years became obsolete, because of the improvement in combs brought about by improvement in bee comb foundation which gave the beekeeper combs without all the flaws of earlier construction before the days of comb foundation. Combs of today, with reinforced foundation, are as nearly perfect as it is possible to achieve. Also, improvement in the breeding of queen bees resulted in increased laying ability, demanding

Wooden box hives with crossed sticks inside, one step toward a modern hive.

The Huish bar hive had only top bars for the combs. Combs had to be cut loose for inspection.



The original Langstroth hive employing the principle of the bee space. The actual dimensions were accidental being the width of lumber available at the local lumber dealers.

Since Langstroth's hive was introduced, some hives have been made much larger than the Langstroth; others, like this Heddon hive, went in the opposite direction becoming smaller.

more room than a single hive can possibly offer.

So, finally, the facility with which any size of hive can be made into a large hive at will by the addition of parts led to the conclusion that any hive which could produce a maximum population with proper management was a satisfactory hive to use.

The hives used today, therefore, have been dictated by the bees and by their requirements, rather than by man and his ingenuity. It is of simple construction and it is used in multiple parts to serve any purpose.

The Langstroth hive calls for two or three hive bodies for brood for colony development to a peak population. This has led to the plan of reversing hive bodies so that the emptier hive bodies are kept on top of the expanding brood unitl the time of the honeyflow and then restricted according to the demands of comb honey production or extracted honey production, with supers above the brood.

Today we have a new group of beekeepers who have revived the 8-frame Langstroth hive. But, because of the extra handling and extra expansion the small hive requires, the majority still use the 10-frame Langstroth. While the large Dadant hive is still in common use in Europe, its extra weight finally eliminated its use in the United States.

With any of these three hives, two or more hive bodies may be used for brood (even in the case of the large Dadant hive). The supers for production of honey to be extracted were usually the same size as the brood bodies in the Langstroth hive, but in recent years shallow supers have become more common.

We have just said that the improvement of queens added greatly to the requirements for brood space in the colonies. Queens of the future may step up this demand so that the management of hives for expansion will become still further intensified and the use of multiple parts will probably increase the use of the reversible plan of management.

When we add this to the possibility of increasing the population of the colony for honey production by the use of two queens instead of one, then the use of multiple parts will be still further emphasized and will probably be the only procedure which can be used. This may greatly increase the cost of equipping a colony of bees for heavy production, but it will also bring about more skillful management and the increase in production will justify the cost.

One diversion from the Langstroth is the so-called "Long Idea" hive. It attempted to convince the bees they should store sidewise. But they do not do so naturally, preferring to move upwards. Long hives are still popular in some parts of Europe and Russia.

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Honey Bee Biology

by DR. WYATT A. MANGUM
Mathematics Department
University of Mary Washington
1301 College Avenue
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e-mail: wmangum@umw.edu

The Bingham Bee Smoker: Marketing Lessons from the Master

In the previous article, we learned how Tracy F. Bingham improved Quinby's original invention, the bee smoker, increasing its practical value to beekeepers. Bingham's contributions were leaving a gap between the bellows and firebox to keep it lit, a wire handle for refueling a hot smoker, and a smoke deflector to keep sparks from falling on the bees. These improvements helped make the smoker a more reliable beekeeping tool. And demand for bee smokers increased. But with demand came competition. Other manufacturers popped up, advertising their smokers in the bee journals, finding distributors, and cutting into the market. Bingham had to compete with them. Or get pushed out.

One competitive advantage was to offer smokers in different sizes, letting beekeepers choose the one best suiting their needs. At first Bingham gave his smokers rather dull, drab, amorphous names like "extra large" and "plain." Later the names changed. The new names were a stroke of marketing flair. They showed an empathic understanding of what a stung-up beekeeper endured with defensive bees and little means to control them.

In 1885, a Bingham advertisement caught the reader's eye with a smoker named "**THE CONQUEROR**," emblazoned across the page, boldly in banner headline style, as if some glorious battle had ended in a victory – this time for the beekeeper. Another Bingham smoker carried a less audacious name, the "Doctor." Nevertheless, it suggested a certain amount of *corrective medicine* for irritable bees.

The Conqueror and Doctor were fairly large smokers with barrel diameters (the fireboxes) of three inches, and three and a half inches, respectively. Later on an even larger smoker size was offered with, by their old standards, a whopping four-inch diameter barrel. It was aptly named the "Smoke Engine." For beekeepers of the 1800's, that name probably conjured up images of a giant rugged railroad steam engine belching

Figure 1. (above) The size difference in Bingham smokers. Note the rather delicate side-hinge on the large Bingham smokers, something of a rarity in itself.

Figure 2. (right) The paper label on a Bingham smoker.

Figure 3. "The New Bingham Smoker" of 1913 combining old and new design elements.

out huge columns of dark smoke into the sky, a mighty source of strength, power, and awe. What a perfect image for a bee smoker.

At the opposite end of the size spectrum, a small petite smoker, with only a one-and-three-quarter inch diameter barrel, carried the do-not-underestimate-me name of "Little Wonder." In later years, its size slowly increased with diameters of up to two and a half inches. Although lower in price, smaller smokers were generally harder to keep lit, which most likely accounted for the size increase. Small smokers could have appealed to beekeepers with a few hives who perhaps only needed smoke for short periods of time. On the other hand, large smokers, smoldering all day, would be favored by beekeepers with many colonies. So to some degree, each smoker size probably found its own niche market among a range of beekeepers maintaining different size operations. Still, each smoker size had to compete with the other sizes or face the possibility of being discontinued. Figure 1 dramatizes the competition aspect with the dwarf-like Little Wonder squared off against a giant Smoke Engine, a kind of David and Goliath scene from a long forgotten bee-smoker world.

With widespread appeal and advertising exposure came a real problem for Bingham – copycat smokers and patent infringements. Looking over the Bingham smokers in my collection, I am reminded of this problem when I read their labels. Though made only of paper and pasted into the valve hole in the bellows, some of these delicate labels still survive (see Figure 2). Notice that the label begins with "The Original Direct-Draft Smoker," and then the label goes on to give Bingham's name and address.

The inclusion of the word "Original" may easily escape the attention of the modern eye, but that wording probably once warned a would-be customer to watch out for imitations. In addition to the smoker itself, advertisements also warned beekeepers about copycats, and to some degree exposed the schemes of their fabricators. One appeal was to stick to something known for its reliability and not to venture off and waste one's hard earned beekeeping dollars on imitators. An ad like this appeared in the August 1879 *American Bee Journal*, an ad also loaded with a threat,

> The old, reliable, original, direct-draft Smoker. This smoker is so perfect that it has never been improved. The more exact the copy the better the Smoker and the plainer the infringement. Beware of all new direct draft Smokers – Bingham owns all there is of value in them. Every seller and buyer is liable.

Notice Bingham's "air tight logic" that leaves no room for maneuvering. The closer you copy his perfect smoker, the more you infringe on his patent.

Thus, was it so with Bingham and his smokers. During the 1880's and into the early 1900's his bee smoker business flourished. The different sizes with their colorful names (Smoke Engine, Doctor, Conqueror, and Little Wonder) gained popularity among beekeepers. Yet as the years spun out, some of them would evolve into today's smoker. How did this happen?

In 1909, Bingham, then 79 years old, sold his bee smoker business to the A. G. Woodman Company[1], a bee supply company, which like Bingham's, was located in Michigan. Bingham's retirement from selling smokers would be but brief. For in 1914, the November *American Bee Journal* announced his passing. At the time, he was in Sugar City, Colorado[2] (though I do not know why he was there). Bingham's beekeeping experience had started when he was a jeweler in Gowanda, New York. As an inventor, he tried making a better hive, but met with little success. His inventive genius flourished when he turned his attention to making a better smoker. After relocating to Michigan, he specialized in selling smokers for some 30 years, becoming prominent and well-known among beekeepers of those decades.

Now the A. G. Woodman Company, located in Grand Rapids, Michigan, had purchased the rights to manufacture the Bingham smokers. The Woodman Company offered an extensive line of beekeeping supplies from hives to extractors, and smokers too. Before acquiring the manufacturing rights, the Woodman Company had been a distributor of the Bingham smokers. Now with the acquisition, they began to modify the smoker. Looking back through the advertisement pictures in the old bee journals and the Woodman supply catalogues, the story of these changes can be pieced together, though the dates are approximations.

The 1911 *American Bee Journal* advertisements still show the Bingham smoker with Bingham's address. In 1912 the advertisements change, still showing the old reliable Bingham smoker, well known among beekeepers, but with the A. G. Woodman Company address. By 1913 comes real

(l) Figure 4. Various transitional smokers with the first modifications made by the A. G. Woodman Company to Bingham's smoker. (r) Figure 5. The next new Bingham smoker from around 1918. The funnel style projects off to the side, but does not extend past it as with the modern style.

change – right into the apiary. The old Bingham smoker is gone forever. The Woodman advertisement in the *American Bee Journal* reads "The New Bingham Smoker," marketing the smoker shown in Figure 3. Notice how the smoker retains the vertical cone and the little smoke deflector with wire handle. When closed, the funnel fits inside the firebox so the tar would not run down the outside of the smoker (like we saw in the previous article). Advertisements promote the smoker as self-cleaning, the soot-burning principle discussed in the previous article. These are all older design elements from Bingham.

Now look for the modern design elements. A sturdy metal hinge connects the funnel to the firebox. And look closely at how the bellows attach to the firebox. The brackets are the modern stamped metal style, replacing the strip of wood and connecting wires that Bingham used. To help prevent air leaks, the bellows have a metal strip around the edges of the wooden boards, not the leather strips that Bingham once used. These finer details show how this version of a Bingham smoker is a transition between old and modern manufacturing styles.

For me the problem was finding this transitional Bingham smoker. As best as I can tell, they were only in production for about five years, which usually makes for a rare smoker. I searched for over 10 years to find my first one. The smoker came in at least four sizes, and they were made in copper (see Figure 4).

Not too long after this transitional Bingham smoker appeared in advertisements, the Woodman Company changed it again. The January 1918 *American Bee Journal* showed the next new Bingham smoker offered for sale (see Figure 5). The funnel was rolled so that the smoke exited to the side, eliminating the need for an extra piece of metal as a deflector. The simplified wire handle, formed in a coil, on top of the funnel resembles the modern version. And the funnel fit on the outside of the firebox – banishing forever the soot-burning principle to little-known obscurity. This smoker style, mass-produced for many years, is commonly seen at flea markets and antique shows.

By 1935, the Woodman Company offers yet another version of the Bingham smoker as shown in Figure 6. Now the funnel projects over the side as we are accustomed to seeing today. The large smoker came with a solid shield around the firebox to prevent burns to – of all places – the shins. A typical working style among commercial beekeepers is to hold the smoker by the bellows from between the knees. That keeps the smoker close at hand. (One thing to note here about collecting these old smokers with a solid shield is that some have an inner lining made of asbestos, regarded now as a hazardous material.)

Leaping ahead to 1963, the Woodman catalogue still shows the new incarnations of what is being called Woodman's Bingham bee smoker, or just Woodman's bee smoker. The Bingham name, once so famous, so well known among beekeepers, was finally fading. Soon to be forgotten. His innovations soon to be forgotten, then taken for granted like they sprang forth, magically from nowhere, at the smoker's first moment of creation. Innovations without history. Ironically, Bingham's inspiring smoker names, Conqueror, Doctor, and the mighty Smoke Engine, lived on for years to come, but eventually would be dropped too. Without any fond farewell by that year, 1963, the small-size Little Wonder smoker had quietly vanished, a casualty of time. To the line, Woodman added the extra large "Big Smoke" with a protective shield, enhancing the general shift to larger smokers.

Figure 6. A Bingham smoker as sold by the A. G. Woodman Company in 1935.

In the early 1970's the Dadant and Sons Company, a long established beekeeping supply firm located in Hamilton, Illinois, acquired the Woodman Company, including their line of bee smokers. The Dadants made changes to the smoker, making it even more durable, and continue manufacturing the smokers we see today. Now when you buy a smoker, think about its long history: invented by Quinby, improved by Bingham, then by the A. G. Woodman Company, and next by Dadant and Sons. We are thus the benefactors of a long line of creative and innovative beekeepers.

Acknowledgments

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

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The Classroom
by Jerry Hayes

Please send your questions to Jerry Hayes,
17505 NW Hwy 335, Williston, FL 32696
Email: gwhayes54@yahoo.com

Wax Moths Do Eat and Digest Wax!

The common information given in most all honey bee "how-to" books say that wax moths, both species, develop by the larvae tunneling through beeswax comb in search of nutrition in the form of cast-off larval skins, pollen, beebread, etc.

Anyone having stored extra frames with used brood comb without protecting it from wax moths usually has a story to tell at some point about the complete destruction of the comb and the thick webbing and frass (feces) that has now replaced the comb. Where did the beeswax go? I had always been taught that beeswax did not have any nutritional value so was pushed aside, crunched away and ignored as the wax moth larvae went about in pursuit of a real meal. Well, like all folklore and old wives tales, to be politically correct, Old Persons' Tales, they were 80% correct.

I had someone ask me if wax moths eat beeswax. I, of course, said no for the standard reasons. Then, I began to think about it and it didn't make sense that they didn't eat it. They would have to consume some to get to the food they really liked. Was it just passed through in their feces/excretia?

Adult moths, larvae and webbing on damaged comb

This is how I get pulled into these things. I started asking questions and searching my memory and the literature.

Wax is (for most animals) indigestible. Wax is a very long chain fatty acid. Because this "fat" is so long, you, I, and other animals do not have the proper enzymes to break it apart and use the fat as an energy, calorie source. Mammal diets are not composed of lots of "wax" so our digestive system has evolved to ignore them and pass them on through without modification. But, life is not always so generalized. Life finds a way and if you eat wax, maybe there is a way provided to digest it.

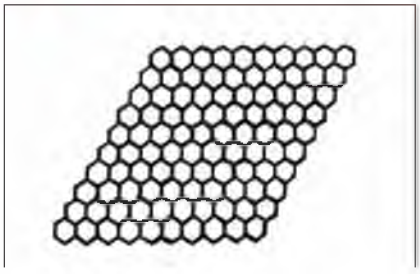
There is a bird called the South African honey guide. This bird is known for its action of guiding humans to nests of feral bees. It attracts attention by squawking, chattering and just being noisy. If it has done its job, it leads the human to the bees' nest. It then waits for the leftovers. It prefers to eat the wax rather than the honey. It likes beeswax so much that there are reports of it entering churches to eat the candles. The Honey guide eats and digests beeswax aided by bacteria in its intestines.

There is lots of "wax" in ocean animals such as plankton, coral, worms, squid, fish, etc. Some sea birds consume up to 2/3 of their digestible energy from these "waxes" eaten in these foods.

So, then we come back to wax moths as another of the physiological curiosities of the insect world. Wax moths can digest not all but some beeswax as a part of their diet. Strangely, there is quite a bit of information available on this in research papers titled, "Digestion of wax by the Greater Wax moth *Galleria mellonela*", " Beeswax in the Nutrition of the Wax Moth", and "Microbes from Apiarian Sources, *Bacillus subitilis*, in frass of the Greater Wax Moth". Feeding growing wax moths a diet including beeswax makes them larger and healthier. It has a nutritional food component for them.

The take-home message for the next bee meeting when someone says, "Wax moths do not eat or digest beeswax" is to politely say, "Excuse me, but I have read research which indicates that this old belief is incorrect." Say this with an appropriate smile.

Q Can Sick Bees Do It?



Hi, my name is Isabella Drudi. I'm a seventh grader at Port Charlotte Middle School and I have a few questions for you. I previously did a science fair project regarding the affect that diseases and pests have on honey production. I was wondering if you had any knowledge about whether the cell size could be affected as well, by diseases and pests? Also, would you know of any labs around the country, as well as the address of the lab in Beltsville, Maryland, that would take samples of comb from a hive for testing? This is for continuation of my science fair project for this fall. I would greatly appreciate any assistance with this matter that you could provide.

Isabella Drudi

A

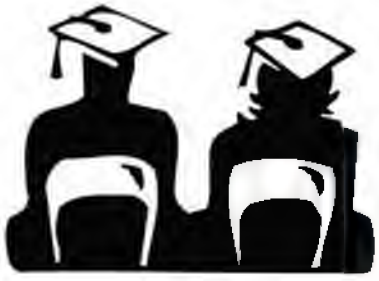
Isabella, I am glad that you are so interested in honey bees. We need more young people who are interested in this fascinating insect. You have an excellent question about honey bee comb cell size. And truthfully, I do not know if honey bee "health" affects cell size when it is being built. There may be data out there, but I am not aware of it. Here is my guess, for what it is worth. Regardless of when the comb is needed, whether in a new swarm establishing a new colony, or a split made from an established colony or internal damage experienced by a colony, it has to be large enough for the particular "caste" that cell (container) is being used for and this size is pre-programmed into the honey bee's mind genetically. Honey bees build several different size cells (containers)—worker, drone, queen—in the course of genetically triggered colony needs. These cells are all a tiny bit different,

as the bees' own construction frailties are taken into consideration.

The worker honey bee's cell size changes as larval skins build up in the cell after multiple generations are raised in the same cell and thus the workers themselves change size becoming slightly smaller over years if the same brood comb is being used. Drones are different sizes and queens are different sizes based on cell size and resources available to feed them. So, do sick bees build smaller cells? Do sick bees build cells at all since this takes a healthy bee that can produce wax to be used to make a cell? What does a bee that emerges with crumpled wings from Deformed Wing Virus transmitted by Varroa do in the colony? It can't fly, but the young bees do not leave the hive anyway, instead they do stuff such as you are talking about. Lots of questions Isabella.

The head of the USDA Beltsville lab is Dr. Jeff Pettis, **Jeff.Pettis@ARS.USDA.GOV**. Dr. Diana Cox-Foster, **dxc12@psu.edu** , is an expert in honey bee viruses and Maryann Frazier, **mfrazier@psu.edu** , is the expert on chemicals in honey bee comb. I wish you all the best on your Science Fair Project.

Q MASTER BEEKEEPER PROGRAMS



Jerry, I have noticed several states, including Florida, offer master beekeeping programs through universities. We do not have such a program in my state. I would like your opinion as to the value of a statewide master beekeeping program.

Deborah Rankin

A

Deborah, you are right that there are lots of Master Beekeeper Courses out there. Some are rigorous such as Florida's, www.UFHoneybee.com. that take a minimum of 4 years to complete and have lots of requirements so that one truly is a Master Beekeeper when it is finished. And, there are those weekend master beekeeper courses that give one a certificate suitable for framing after 8 hours of watching videos. People place value on those things which give them the most return for their investment. We have made available a long, hard, demanding course of study and verification. After you have reviewed the course work at the web site above, you will see that this meets our goal of having an equivalent University Master Degree level of training, education, testing, public service and effort. Beekeepers completing this program can represent the beekeeping industry anywhere with professionalism. This level of training and commitment is not for everyone. We have about 30 in our program here and more signing up for the 1-year entry-level program all the time. The ultimate goal is to have highly educated beekeepers who can be the point of contact in their hometown or region for all things honey bee. This can't be done with a weekend program.

It all depends on what you want for your state Deborah. It also depends on if your beekeepers want this and if you have the university support and infrastructure to make it work.

Q Another Great Idea?

This is my first time to write, but I have a simple question: Have you checked out the rotating frames hive at: **http://www.anivet.hu/download/8old/8oldGB.pdf**

What's your take on them?

Greg

A

I saw a couple of versions of the rotating hive at the 2009 Apimondia convention in France. Honey Bees have been around for millions of years. They live in almost every climate the Earth has to offer. They live in tree cavities, rock cavities, cavities in the ground, mailboxes, BBQ grills, and in the open exposed to everything. They are survivors. My guess is that they can live in a rotating frame hive. Whether it helps them live successfully is another question. I have found that when a new hive design becomes too complicated and expensive, it seldom becomes popular with beekeepers. At least in the United States, beekeepers want simplicity and utility without great cost.

Q Supersedure Followed By Supersedure

Hi Jerry, I have been keeping bees for 4 years and will go into the coming winter with 14 hives (if you can call what we have in mid-state Georgia "winter"). I recently switched most of my hives to New World Carniolan (NWC) queens, which I obtained from a breeder (as opposed to a producer). One hive has been very persistent about producing supersedure cells and I am not sure why. The old queen was making some pretty aggressive workers, but the new queen was introduced in mid July and it is now early October, so most if not all of the workers from the prior queen should be gone (and the hive is no longer overly aggressive).

The new queen is producing lots of brood with a good pattern. The bees seem to be fairly hygienic (based on how well they herd small hive beetles together). The hive has good reserves for the winter, but is not honey-bound and is not overly crowded. We have had enough cool nights that the bees shouldn't need to swarm. The only Varroa treatment I have used this fall is powdered sugar, but I have not seen any deformed wings or other evidence of viral problems. I have not, however, done any counts on Varroa drop. I have not had supersedure problems in any of my other hives (except immediately after the new queens were introduced).

I am guessing that this one queen simply is not producing much queen pheromone, but I am curious if you have any other thoughts. The problem now is that after cutting all the queen cells for the past two

months, I am wondering if I shouldn't get rid of this queen before winter sets in. Maybe the bees know something I don't - or maybe they'll keep trying to supersede this queen until they slip a cell past me, at which point it may be too late in the year for the superseding queen to mate well.

Will
Athens, GA

A

It may be a tad too late for anything that needs to be done even in the relatively mild Athens, Georgia winter. Constant supersedure is just what you say—the workers are not recognizing her as a queen. Queens may be incompletely mated because there were not enough drones (up to 40) or 40 drones that have less sperm than normal because of exposure to chemicals (miticides) during development and are shooting blanks. Or, the queen is laying so poorly that the brood pheromones being produced are so reduced that the workers don't think the queen is living up to expectations and needs. Days are growing shorter quickly, temperatures are dropping and drone populations are dropping just as quickly. It may be too late (October) to now reconsider allowing them to supersede.

SHB herding is not a trait of hygienic behavior. Varroa levels or disease recognition and clean up is the hygienic trait. You have not surveyed for varroa, so you don't know what your varroa population is. Deformed wings can or can't be a symptom of varroa. It is not a guarantee. Treating for varroa now may or may not help if there is a significant infestation because of weakening of the workers produced that are specific for winter and different physiologically than "summer" bees.

So, it is not looking good, Will. These are your options: 1. Let the colony alone and see what happens. 2. Buy a queen and requeen. 3. Treat for varroa and #2 and cross your fingers. 4. Treat for varroa and let winter decide. I wish we had talked about this in August.

Q Screened Bottoms at 7000 Feet?

Jerry, I've been using screened bottom boards here in northern New Mexico (7000 ft elevation) for several years. I've always closed the screened area with Masonite for the winter. I'm considering leaving them open this winter for better ventilation. What's your opinion/experience?

Thanks,
Steve Wall

A

Steve, leave it open. I know some beekeepers recommend closing off the screened bottom boards in the winter, but my opinion is that cold doesn't kill honey bees. Weakness caused by varroa, diseases, food scarcity, etc., make it difficult for honey bees to thermo regulate and withstand cold temperatures as a cluster. Healthy bees laugh, if bees can laugh, at cold. Keep the colonies out of direct wind and be sure all other standard winter preparations are in order, then go inside and read the ABJ.

Q Using FUMAGILIN-B Off Label

For many years I have faithfully medicated my bees in fall with Fumagilin-B per label with good results. This fall a deep, early cold spell caused my bees to go into a loose cluster and they have refused to take the medicated syrup in any significant amount from division board feeders. One of my students suggested mixing the Fumagilin with powered sugar and dusting the bees. As a last resort, I did this off-label procedure. I used a teaspoon per cup per ordinary hive and had only a little fall through to the removable bottom tray. Has a similar application been successfully tried? I don't think I did any harm, but did I merely waste Fumagilin?

The Rev. Eugene Lehrke
Silver Bay, MN

A

You probably didn't help treat for Nosema, but you may have removed some phoretic (exposed) varroa mites with the powdered sugar. It wouldn't work for Nosema control, if you had a Nosema problem at all. Nosema, both *apis* and *ceranae* varieties, has cyclical population levels that may or may not correspond to a standard prophylactic fall, winter, spring or summer selected treatment time. Beekeepers do a lot of stuff without knowing why or why not. Analogy: Do you treat yourself with antibiotics in fall because you think it will stop you from getting Strep throat?

EUGENE RESPONDS:

Jerry, no I wouldn't take medicine when not yet sick, but are you saying that the old lesson well learned by me of medicating for Nosema in the fall has been superseded? Years ago we were taught that Nosema is contracted from wherever, and is reasonably well tolerated by the bees during their active flying season when they can defecate outside the hive, but that residual Nosema causes excessive stress during the flightless winter and will often cause a mess in the hive and even colony death if the bees are not purged with Fumagilin-B beforehand. I've read and appreciated Randy Oliver's suggestion of getting a microscope to test for Nosema when noticing symptoms and medicating accordingly — rather high-tech at any rate for small beekeepers. But winter can and often is cruel and long up here in the north with no mid-winter opportunity to monitor the health of the bees. On a few occasions in the past, I couldn't medicate my bees in fall or they didn't indulge sufficiently and so paid a messy an expensive price.

Eugene

A

Eugene, not all bees have Nosema all the time. When a colony is surveyed some of the bees have no identifiable Nosema spores, some will have several million and then others will be in the middle somewhere. Weeks or months being confined without a voiding flight after feeding on poor quality indigestible honey is a recipe for Nosema to reproduce in their full guts, you are right. There is new data available that shows that the standard Nosema treatments and some newer treatments do not work as one would hope they would. That is because sometimes Nosema is highly present and sometimes it isn't.

Here is a quick field test. Take an older worker, preferably at the entrance. Hold her head and thorax with your left hand (if you are right-handed). With your right hand, using your fingernails/fingertips (or a pair of tweezers), grab the very tip of the abdomen without getting stung and pull it; the intestines should come out. If the intestines are pearly glistening white, then this bee most likely has Nosema. If the intestines are darker, a little gray (not white), this bee is not affected. But, then you still have to make a decision to treat or not with something that may or may not work. If beekeeping were easy, everybody would be doing it.

Q Buy A Queen... Raise A Queen?

Jerry, we have all been taught that a good commercial queen breeder's queens will outperform the queens that the bees raise on their own with no formal breeding program.

Has anyone ever tested this hypothesis (e.g. does a commercial "quality" queen's colony really produce enough extra honey to justify the cost of the queen)?

For my personal operation, a purchased queen's colony will have to produce at least 15 pounds more honey than its naturally requeened row mate to justify the requeening expense and time. This works out to a 30% increase over the area's 50-lb/hive average honey crop.

I realize I am considering only honey production here, while most queen breeders look at several traits. Still, honey production improvement should be an easy trait to test.

Bill Miller
Dothan, AL

A

Good morning Bill. The main advantage to commercial queens in comparison to supersedure or swarming-induced honey bee queens is that they are generally selected at the correct young larval age of 3 days or less. This allows earlier feeding by nurse bees with royal jelly, which allows for more ovarioles (egg-producing structures) to be formed from this queen-specific food. Then, we must assume that chemicals from varroa control, in particular, have not damaged her ovarioles or her production of queen pheromones. That is only one piece of the puzzle. The next piece is how many fertile drones she is able to mate with that will contribute the proper amount of sperm to be stored in her sperm storage organ, the spermatheca. Now add in the negative effect of viruses that the sperm may horizontally transfer from the drone to the queen.

The reality is that at the present time commercially produced queens do not last very long, sometimes a matter of weeks or months at the longest—in comparison to years before tracheal mites and varroa arrived. But, the queens that the colony produces as they try to replace her as supersedure queens do not last very long either. The supersedure queens supersede.

All of that to say that I do not know of any recent data that has looked at the value of commercially produced queens from a production economic basis. To use one of my standard sayings, an opinion is like a nose, everybody has one and mine is that the value of commercially produced queens is not as great as it once was. One can still have better success raising locally adapted queens and drones *if* it is done right.

Q Fermented Honey?

This fall I extracted my honey. It was very dark and viscous. When I bottled it there was about 1/8 inch of air bubbles on the top after the honey had settled. I stored the honey in the basement where the temperature is about 60 degrees F. When I brought the jar upstairs and opened it, it foamed like a volcano. (See photo 1.)

The honey does not smell sour. It has a good honey taste. Everything seems good except for the bubbles. I tried opening several jars and poured them into a measuring glass and they formed air bubbles almost instantly. (See photo 2.)

I tried opening several jars and heating the honey to 120 degrees F and it just bubbled. (See photo 3.) Do you have any idea what has happened to the honey? Is there anything I can do to stop the bubbles from forming? Is there any reason it cannot be eaten?

Leigh K. Lydecker, Jr

A

I like the marketing angle of carbonated honey (just kidding). From past experience, fermentation can occur at temperatures noted, either from yeasts or various bacteria or a combination thereof. It doesn't have to have an alcohol smell taste or an acetic acid smell. There is a drink in many parts of Asia called *Kumbucha* that has effervescence from bacterial and yeast fermentation in sweetened tea. It has little "sour" smell and little alcohol. I'm guessing your problem was caused by fermentation in high moisture honey due to sugar-tolerant yeast. If you do not detect an alcohol smell or taste, you could still eat the honey, but do not sell it to anyone in this condition.

Your best preservation method for future reference is to freeze the honey in a home freezer. This will prevent fermentation, even if excessive moisture and/or sugar-tolerant yeast cells are present. If this is not possible, keep the honey at room temperature and if it starts to show any signs of fermentation (bubbles, alcohol taste), heat the honey to 145 degrees F. for 30 minutes. This will kill the yeast cells and stop further fermentation, but it will also darken your honey and ruin some of its fresh taste and smell.

Photo 1. Foaming bottle of honey

Photo 2. Foaming honey in measuring glass

Photo 3. heating the foaming honey

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Strategies to Lower Your Tax Liability

by HOWARD SCOTT

As beekeepers, we all have the obligation to file all honey sales. For most of us, it's a sideline income. But that still doesn't exempt you from listing beekeeping revenue. The IRS states that all worldwide income must be entered on the tax return, whether $10 or $10,000. Furthermore, non-compliance can be fraud, which could result in serious penalty.

But, at the same time, the IRS allows us to subtract all expenses from the inflow, to arrive at a net profit. It is the net profit which is taxed. Whether you file a Schedule C (self-employment) or Schedule F (farming) or hobby income (revenue on line 21 of the 1040 and expenses on Schedule A), we file these expenses associated with our beekeeping activity.

In this article, I will offer five strategies to lower net profit, which in turn will minimize your beekeeping-activity tax liability (the amount of taxes you pay on your return).

■ Home office deduction. Home office deduction can be used when the beekeeper uses a portion of the house regularly and exclusively to do bee work. An example would be if if there is a honey house on the property, that conforms to the regularly and exclusively standards. However, if the beekeeper has a corner downstairs where operates his beekeeping activity, whether extracting, bottling, or maintaining hives, and doesn't do much else in this spot, that qualifies as a home office. If a beekeeper has a place where he does all his administrative work (orders supplies, keeps product, figures out prices, pays bills) and doesn't do much else, that too qualifies. The new home office rules state that if that exclusive place exists, one can add other space in the basement or garage, where product is stored, where supplies are kept, or where experimenting and tinkering is done, even if this space isn't exclusively used for beekeeping activities.

To determine the home office deduction, the tax preparer divides square footage used by for beekeeping activity, both exclusive space and non-exclusive space, into square footage of the total house. This results in a percentage. Perhaps it might be 6% or 10%.

Once you determine the percentage of use, add up home costs—mortgage interest, property taxes, utilities, maintenance, remodeling—and multiply the use percentage times the house costs, and that's your home office deduction. So, if your home costs came to $15,000, and your home office percent is 10%, then you can deduct $1,500 as your home office expense ($15,000 X 10%).

The beauty of the home office deduction is that you receive a credit without spending any money. All deductions come from your home costs which continue whether you keep bees or not. Plus, it can be quite a substantial deduction because today's house costs are high. An accountant will have to compute depreciation, but that could easily run $3,000, whether the homeowner carries a mortgage or not.

One thing that a home office deduction will not do is allow the business owner to lose money. That is, home office deduction reduces revenue to zero, but does not allow the business to go into the red. But you are trying to lower your tax liability, not get a benefit—tax credit—from beekeeping, so a home office deduction is an excellent vehicle.

Some conservative accountants don't like setting up home offices because, they say, it sets up a red flag. But in this day and age, with more and more of the labor force working at home and with at-home businesses proliferating, nothing could be farther from the truth. Home offices are normal for perhaps half of the white collar workforce. Plus, you are talking about a sideline income. It isn't that much money to worry about, for you or the IRS. So don't be deterred by this red flag warning. If you are eligible, take a home office deduction.

■ Mileage. You can deduct all relevant business miles as car and truck expense. You have two choices: to take the number of miles driven times a fixed amount (Standard Mileage), or, alternately, you can take the proportionate share of vehicle expenses (Actual Expense). My advice is to use the Standard Mileage formula, to keep matters simple. This year the standard mileage rate is 55 cents per mile. So if you drive 2,500 miles in a year, that's a $1,375 deduction.

What constitutes related mileage?

■ All trips to pick up supplies.

■ All trips to and from fairs, deliveries, and processing centers.

■ All trips to club meetings and group-work sessions. Certainly, these experiences help you be a better beekeeper and are legitimate miles.

■ Any visits to fairs which you might consider doing, or stores you might consider selling to. These are selling expeditions and count as deductible mileage.

■ Visits to other beekeepers for the purpose of enabling you to perform your work better. Say you travel 20 miles to a beekeeper who is lending you an observation hive. Or, you visit a beekeeper who is raising queens to learn how the activity is done. Both are deductible miles. In fact, anything that helps you become a better beekeeper adds to mileage. If you do have a home office, the definition says, in effect, all mileage to and from your principal place of business (home office) to any bee-related activity is deductible travel.

If you insist on using Actual Costs, then compute the percentage of bee use to total use (much like home office) and use that percent to determine gas costs, depreciation expense, tire replacement, and repairs. But, complications arise when you sell one car and buy another. If there's a gain, you might be responsible for some of the sale profits. So simply use Standard Mileage and avoid that problem.

To maintain a record of mileage, keep a small notebook in the car. Every time you go someplace related to beekeeping, mark down the date, the round-trip mileage, and the purpose of the trip. At year's end, total up the figures and you have total mileage. It

might seem like a nuisance, but, once you get into the habit, it will become second nature, like buckling yourself into the car seat.

■ Trips and conventions. Many individuals forget to include these expenses. But if you and your spouse travel to a national convention or regional meeting, at least half of the cost can be deducted. Why? Because you are attending this event in the hopes that you will learn something and that your attendance will make you a more skilled beekeeper. Your spouse's extra charges can not be deducted.

Beekeeping Conventions

Here's an example. You and your wife go to an EAS convention in a distant city. You spend $1,000 for round-trip airfare, $550 for the hotel, $250 for car rental, $500 for meals and entertainment, including a $100 meal to treat a few beekeeper friends. How much is a deductible expense? Half of the airfare is usable, for that is your share. The entire hotel ($550) and car rental ($250) is deductible, because you would have spent this sum whether your wife came or not. Then about $350 of meals and entertainment is deductible. $250 is half of the meals charges, but another $100 was spent on treating fellow professionals wherein presumably something was learned. And you could argue that even though the wife's cost in included in that $100, the full amount can be used because the full cost resulted in a learning experience. All in all, from the $2,300 trip, your beekeeping deductions are $1,650 ($500 + $550 + $250 + $350). It would have been incorrect to only take $1,150, half the cost of the trip, because $1,650 is applicable, and that is 72% of the trip. Keep this in mind the next time you apportion costs.

■ Section 179 Expense. Section 179 is equipment purchase deduction. While traditionally equipment cost is supposed to be apportioned (depreciated) over the life of the equipment, either five or seven, or 15 years, Section 179 allows the business owner to take 100% of the purchase off in the year of purchase, up to $250,000. So if you purchase an $800 extractor, you can take off $800 as an expense.

Generally, it pays to take the full Section 179 deduction because the beekeeper wants to lower profit to zero. Taking an $800 expense is better than taking an $160 expense (which is the annual deduction of five-year depreciation). Unless, of course, the beekeeper has already reduced his profit to zero, then taking standard depreciation would be preferable.

■ Don't call beekeeping hobby income. If the activity is deemed a hobby, the expenses could be diluted. That's because expenses are put on Schedule A job expenses, subject to 2% of total income reduction. If you earned $100,000, the 2% threshold is $2,000, effectively reducing expenses by the same amount. If beekeeping revenue is $5,000 and expenses are $3,000, you will only get credit for $1,000 expenses, because $2000 of the expenses are eliminated on account of the threshold. If you file as a for-profit entity (either Schedule C or Schedule F), you will receive the full $3,000 deduction. If a business, you will pay taxes on $2,000 profit ($5,000 minus $3,000). If a hobby, you will pay taxes on $4,000 ($5,000 minus $1,000 allowable expenses).

The determination of whether to be a for-profit business or a hobby is intent. If your intent is to be a business, then set yourself up that way. However, the one caveat is that if you lose money (suffer a loss) in three out of five years, the IRS may deem your business a hobby. On the other hand, it is perfectly okay to approach zero profits, and remain a for-profit venture.

Use these tax strategies, and you'll pay less to Uncle Sam, while still complying with the IRS.

Scott is a 13 year H & R Block tax preparer, specializing in small businesses. He is also a 25-year beekeeper.

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Sustainable Beekeeping

by NANCY OSTIGUY
Associate Professor, Penn State

Whether or not you have experienced Colony Collapse Disorder, you are probably thinking that the bees are trying to tell us something: What we beekeepers have been doing is not working.

Common complaints include colonies building up too slowly in the spring, queens needing replacement with increasing frequency, less honey production, and colonies not living as long as they did in the past. Beekeepers are not alone in thinking that honey bees are in trouble. In 2007, the National Academy of Sciences reported a worldwide decline in pollinators (Berenbaum et al. 2007), which is leading to a decline in pollination services (Biesmeijer et al. 2006). Our concern is justified: pollinators, and honey bees in particular, are critical for the pollination of food crops. Taken together, pollinator contributions to agriculture have an estimated worth of over $194.6 billion per year (Gallai et al 2008). All this is telling us that if we are to continue to have fruits and vegetables in our diet – let alone a diverse ecosystem – we need to change how we are managing our honey bees.

Starting with our use of Terramycin for American Foulbrood control, and continuing through the use of various pesiticides for Varroa and Small Hive Beetle control, we beekeepers and researchers have been looking for magic bullets to solve the honey bee's problems. Solutions addressing honey bee health that have claimed to be simultaneously easy, cheap and effective have failed. I believe these "magic bullets" have only masked the problems they were purported to "solve." Not only do the problems remain but their solutions, I believe, are among the causes of our current bee losses. We need to face the reality that the potential for developing the perfect solution is about as likely as the chance for that proverbial snowball to survive.

The first magic bullet, the pesticide (meaning: pest killer) Terramycin®, was introduced for American Foulbrood control. But we beekeepers decided this was okay because we all know that antibiotics are good and only bad things are harmed by antibiotics. [More on this fallacy later.] This introduction of pesticides into beekeeping opened the door to all manner of magic bullet colony "treatments". When varroa control became necessary, the idea of a chemical solution was an easy sell. Our continuing search for magic bullets has lead us to an amazing place. Today we have Terramycin-resistant American Foulbrood, and Apistan®- and CheckMite+®- resistant varroa. We use Guardstar®, a permethrin with known high toxicity to honey bees, to control Small Hive Beetle in our apiaries, and viruses, as evidenced by deformed wing bees, run rampant through colonies. We find the antibiotic tylosin (Tylan®) in honey (Adams et al. 2007, Thompson et al. 2007). Wax, honey and pollen all contain measurable pesticide residues. We find the pesticides Apistan® and CheckMite+® in honey (especially honey consumed by bees overwinter, unpublished data), and these are also the most common pesticides detected in beeswax (Frazier et al. 2008). Despite this growing disaster we continue use to look for single, simple solutions while wondering why our bees are dying, our colonies are not building up well in the spring, and our honey production is down. Maybe it is time to remind ourselves that insanity is doing the same thing over and over again expecting the result to be different.

There is no better time than now to step back, remind ourselves of our ultimate goal, and ask whether our strategy is working to achieve it. Our goal is simple. We want long-lived and productive – in other words, *sustainable* – colonies. As evidenced by the unprecidented level of colony loss since the introduction of varroa mites in 1987 it is clear that our present strategies for colony management are not working. We need a new set of strategies.

What should those strategies be? Let's tackle that question by breaking our goal down into concrete, measurable objectives. Good strategies will be those that help us meet our objectives.

Colony productivity can be assessed by honey production, colony strength and foraging rate. An estimate of colony strength and predictive information about honey production and pollen storage can be obtained from measuring only foraging rate.

Colony longevity is easily measured. The elements that contribute to high colony longevity – a healthy, long-lived and productive queen, low disease and parasitism rates, low individual bee death rates and low drones to workers ratio – provide additional details that are critical to our understanding why and how a colony dies. We can evaluate colony management success via measurements of all of these elements.

Now that we know our goal, and how to measure whether we are moving nearer to, or further away, from it, we can ask what our bees need in order that we can reach our goal.

The problem we face with bee colony health today is analogous to the problem we faced with human "colony" health – i.e., cities – in the middle of the nineteenth century. Let's seek guidance by looking at what we did to achieve the dramatic improvements in human health beginning in 1850. We purified drinking water, decreased workplace hazards, improved housing, provided vaccinations, and cleaned up the environment. We were also taught to do some things personally - eat well, drink plenty of water, practice good hygiene, exercise, get regular physicals, reduce stress, stay away from sick people, and stay home from work or school when sick. All of our successful strategies can be characterized by one pithy slogan,

coined one hundred years earlier by Benjamin Franklin: An ounce of prevention is worth a pound of cure.

Let's try applying these ideas to bees, bearing in mind three things: (1) what happens to the individual bee affects the whole colony, (2) what happens to a colony will affect a neighboring colony, and (3) everything is connected. Bees are our 'workers'; we need to provide them with a safe, healthy work and living environment. We could consider ourselves lucky that they cannot unionize; but then if they could, maybe we would have addressed bee health problems sooner!

Are our bees eating well?

During the summer months most colonies experience a dearth of nectar and pollen. We know that short bouts of starvation (more than fasting for a single day or two) cause problems for humans, including decreased longevity and increased susceptibility to disease. Consider feeding your bees when the dearth is long – even if it is of "normal" length.

Honey bees are generalist pollinators. When we put bees on a single crop, where even the weeds are scarce, there is only one source of nectar or pollen. Parents know that there is no need to worry about their child's desire to eat only oranges and hotdogs today as long as the child's weekly diet is diverse enough to contain all the necessary nutrients. Consider the diversity of forage resources when placing your colonies. We need to advocate more "weeds" and wild/unmanaged areas when we bring our bees in for pollination. Growers want healthy colonies; their management decisions impact our colonies. We need to locate our apiaries were the diversity of forage is high.

Are our bees drinking plenty of clean water?

If you are like most beekeepers, you think even less about water sources than forage. Water should be plentiful and clean. The water source should not be contaminated with bacteria; even bacteria that is not known to cause bees to become ill may be problematic because of the adverse impact of varroa mites on the bee's immune system (Yang and Cox-Foster 2005).

Chemicals, including pesticides, may be present in the water. Changes in agricultural practices over the last 30 years have increased the likelihood that agricultural runoff, containing pesticides and other potentially harmful chemicals, will be the only source of water for many bees working a pollination contract. We need to begin thinking about providing bees with potable water.

Do we give our bees a physical?

When was the last time you gave your colonies a physical? Do you monitor for pests and diseases or wait to see who survives winter? Mites play a critical role in colony health and survivorship; so knowing how severe the mite infestation is will determine if you are going to meet your goals of colony longevity and productivity. The most important component of disease and pest monitoring is doing it. The most common methods for varroa monitoring are (1) stickyboards placed beneath the screened bottom, (2) powdered sugar shakes, and (3) ether rolls. The most reliable method is a 3-day stickyboard using petroleum jelly (unpublished data). *Do not use vegetable oil!* Mites can walk several inches through petroleum jelly: vegetable oil is not even a challenge! While the 3-day sticky board is the most reliable monitoring technique, that reliability is irrelevant if you do not use it. Monitoring your colonies is like exercise: pick a method that works for you and that you will continue for the long haul.

Does your state have a honey bee inspection program, or are you left on your own to figure out when American Foulbrood or other diseases are present? Learn everything you can about bee diseases by talking to veteran beekeepers and taking classes. Helping your bees practice good hygiene depends upon you knowing your bees. Consider advocating with your local and state beekeeping associations for an apiary inspection program that will help you help your bees. Healthy bees are in everyone's best interest.

Do we practice good bee hygiene?

Are we doing the best we can to help the bees practice good hygiene? We should not limit what we do to buying hygienic queens and selecting for hygienic behavior in our own colonies. Help your bees by ventilating hives to keep moisture from accumulating, replacing bottom boards with screens so that at least some mites can fall out of the colony onto the ground rather than climbing back on the bees from the bottom board, and reducing the number of hive bodies so as not to exceed the ability of the colony to control wax moth, hive beetles or other pests.

Are you collecting the wax scraped from your colonies, or are you dropping it on the ground for wax moth and small hive beetle? The moths and beetles might thank you, but the bees would prefer that you remove all wax outside the hives.

Are your hive bodies and frames in good repair, or do pest have multiple entrances into the hive? Can water drip into your colony through cracks or splits around the corners? Do your bees have to fight the outside elements inside the hive? Better health is related to homes in good repair.

Disease rates can be influenced by your management of hive frames. Is the wax in your hives less than 2-3 years old, or is it a potential source of American Foulbrood spores and chemical contaminants? Are you moving disease and mites around your colony by moving frames of brood and/or bees between colonies? *Never* move a frame from a weak or sick colony to a healthy colony. If you need to move bees and/or brood from a healthy to a weak colony, use the opportunity to recycle your old frames, putting a new frame into the healthy colony.

Are you giving your bees a continuous supply of Terramycin or tylosin for American Foulbrood control? Continuous exposure to an antibiotic aids the development of antibiotic resistance. Antibiotics kill beneficial bacteria as well as pathogens. You may be killing the beneficial bacteria bees need for good health. While little is known about beneficial bacteria in honey bees, when we have looked in other organisms beneficial bacteria have been found.

Can your bees propolize the inside of the hive body, thereby using the antibacterial properties of propolis to maintain colony health; or, is the wood inside the hive body smooth? Consider roughing the inside of your hive bodies. Talk with the producers of hive equipment and ask them to avoid the use of smooth finished wood on hive interiors. According to proponents of top bar hives, bees propolize the interior of these colonies (personal communication). Consider switching the type of your hive equipment.

Are you using drone brood removal, especially in the spring, to control varroa? Providing drone comb early in the spring can be an effective means to reduce mite populations. Taking this simple preventative measure may be sufficient to make other mite control tactics unnecessary!

What are we doing to to reduce bee crowding?

Are you helping your bees identify their hive, or are they confusing their home with nearby hives? Drifting is enhanced by similar hive features and close colony proximity. Feral honey bees are less likely to drift – unintentionally enter another colony's hive – because colony to colony distances and unique hive features assist bees in finding their hive. The hive of feral colonies differs in physical characteristics and location:i.e., tree shape and height, shape and direction of the hive entrance in the tree, type and spacing of surrounding trees and other plants, ground topography are all different. Colors, shapes and relative placement of physical features on the hives all help the bees locate the correct colony.

While quantity of forage is probably the largest determinant of the distance between two feral colonies, disease and parasite transmission also increases with decreased separation, resulting in the selective elimination of colonies that are spatially nearby. If you have multiple hives on a single pallet, your colonies are living under conditions as far from natural conditions as it is possible. If one colony is sick, the other colonies on that pallet are – or soon will be – sick. The closer the proximity of your colonies, the greater the risk of colony to colony transmission of disease and parasites. Consider increasing the distance among colonies and/or reducing the number of colonies per apiary. It might be slightly less convenient to work your colonies when they are spread-out, but reaching the goal of greater colony longevity will be more readily attained.

Have you ever had to ask at the front desk of your hotel for your room number when

you returned from dinner? Our apiaries tend to be like hotel rooms – so identical that being anything other than in top form can cause the bees to wander around confused. For many years we have known that placing colonies in a line increases drifting (50-59%) towards the end colonies (Jay 1966). Placing colonies in concentric circles, at least 1 meter apart, with entrances all facing south was found to lead to extremely low drifting rates – 0.1-3% (unpublished data). How are the hives in your apiary arranged? Are your hive bodies identical? Consider painting hive bodies different colors or painting different shapes on the exterior. Maybe different colors/shapes on the lids would be the easiest distinctive characteristic to include in your operation.

Are we reducing bee stress or increasing it?

Are your bees in a highly managed or monocrop ecosystem? Low floral diversity and quantity may result in stress. Bees evolved as generalist pollinators: monocrop or low floral diversity ecosystems make it difficult for them to be the generalists they evolved to be. When we control the land surrounding our apiaries, we can plant pollinator-friendly crops, trees, shrubs and other plants. Consider talking to the landowner(s) surrounding your apairy about how he/she can help honey bee health by providing floral diversity. Consider talking to the growers where your colonies are located, asking for more unmanaged areas where weeds are allowed to grow and provide forage diversity.

Because droughts are usually associated with higher temperatures, the stress caused by lack of water is intensified. Little can be done to prevent droughts, but their impacts can be mitigated by providing water for the bees whenever natural sources are lacking or contaminated.

Putting bees on the back of truck to haul them to various pollination contract locations is stressful; the high loss of queens reported by migratory beekeepers is an indicator of this stress. Even if you move your bees only short distances, the stress will increase any problems already existing in the colony. Consider talking with growers about permanent or semi-permanent placement of your colonies. Changes in land management practices may be necessary to ensure sufficient forage, but with healthier colonies the quantity and quality of the pollination per colony will improve and fewer colonies may be needed in each location.

Are we helping our bees avoid spreading diseases and parasites?

Are you moving bees and brood among your colonies? Disease and parasities are spread from bee to bee and from colony to colony. While we have little direct impact on bee to bee spread our management practicies can have a tremendous influence on colony to colony spread. Moving frames of bees and/or brood between colonies increases the risk of colony to colony transmission of disease and parasites. Moving a frame from a strong to a weak colony should be low risk, but it may not lead to the intended outcome – a healthier colony. A strong colony is not necessarily a disease/parasite-free colony: what is important is that the number of infected bees be small compared to the total bee population. Moving healthy people in with sick people doesn't make the sick healthy: it makes the healthy sick! In the same way, adding healthy brood/adults into weak colonies may not have the desired effect of improving the weak colony. Similarly, it is nearly a certainty that moving frames from a weak to a strong colony will introduce disease and pests into the stronger colony, weakening both and hindering your goal of sustainable colonies. Beekeepers have known for many years that merging two or more weak colonies results in a single weak colony: further evidence that both the presence of disease/parasites and the proportion of sick to health bees are important in determining colony health. From a colony health perspective, it may be a waste of time and effort to move frames of bees among colonies.

Are you increasing or decreasing the chance of your bees drifting or robbing? Drifting and robbing are significant routes for colony to colony disease and parasite spread. As mentioned earlier, drifting is not a significant problem with feral honey bees because individual bees are unlikely to inadvertently enter another colony's hive. Distance and the distinctive features of each colony's hive help bees, even the most navigationally challenged, find the correct colony. Robbing is likely to be the primary means of disease and parasite spread among feral colonies. Even so, robbing is less frequent in feral colonies compared to managed honey bee colonies because distances between colonies limit the number of colonies/bees that can participate in a robbing event. For our convenience we create apiaries – reducing the distance among colonies – and use identical looking hives – eliminating distinctive characteristics between colony hives. This means the rate of drifting and robbing we experience are under our control. How close together are your colonies? If you have colonies on the same pallet or touching in any way, the probability of individual bees entering the wrong hive is high. Consider increasing the distance between colonies and arranging them in a random, non-linear fashion. As mentioned above, we obtained extremely low drifting rates when colonies were placed in concentric circles 1 meter apart with hive entrances all facing south. Do your colonies look identical? There would be fewer confused hotel guests if the decor of each floor differed and the doors to each room were distinct. Consider increasing the unique visual characteristics of your hives.

Do you know where your drones are? Colonies need drones when virgin queens need to take their mating flights; after that, drones are no longer necessary. Limiting drone populations (and limiting the production of drones to your healthest colonies) will reduce the risk of drones moving diseases and parasites among colonies.

Are we isolating our sick bees?

It is critical to differentiate between healthy and sick colonies. If a colony is weak and you don't know why, it is only prudent to assume that an illness is the cause, that the illness can be transmitted to your other colonies, and that you should to act to isolate the weak colony. To do otherwise is to jeopardize your healthy colonies. Consider using entrance reducers when a colony is first becoming weaker than other colonies.

It is hard to decide when a colony is dying and we can do nothing to prevent it. Determine in advance the criteria you will use to decide when a colony needs to be removed/eliminated. For the health of your other colonies you need to be able to make this assessment early enough to limit the spread of disease and parasites. If you have decided to isolate sick/weak colonies, an ideal "sick bay" should be located at least 3-5 miles from healthy colonies in order to prevent robbing. If a "sick bay" is not available, then consider being ruthless for the sake of your other colonies.

A Sustainable Beekeeping Management Plan

Beekeeping is not a one-size fits all activity. Keeping in mind that your conditions differ from mine, here is a description of how we are attempting to achieve the goals of productive and sustainable colonies.

- All our hives are fitted with screened bottoms and oriented with facing south entrances, with a minimum distance of 1 meter between colonies. Our apiaries are being reconfigured into concentric circles.
- We begin with the bee stock that survives in our central Pennsylvania location and includes hygienic and varroa resistance/tolerance. All wax in our colonies is less than 3 years old. We are moving toward coating plastic foundation with our own capping wax to reduce the chemical residues in the wax.
- We avoid the use of *all* antibiotics in our colonies. If we detect American Foulbrood in a colony, we shake the colony onto an undrawn foundation and burn *all* hive equipment. If the colony is unable to clear the infection, or the infection returns, the colony and equipment are burned.
- In the early spring, drawn drone comb is inserted into the colonies and removed after capping. Frames are frozen for at least 48 hours and returned to the colony for cleaning. A second drone comb removal cycle may be implemented later in the season if mite pressure is high.
- Using stickyboards, mite populations are monitored bi-weekly. (The boards are inserted into and removed from the hive via a slot in the hive rear.) Sustainable

colonies in the presence of varroa is a challenge; our colonies must survive without the use of synthetic miticides only. Colonies with high mite loads – greater than 100 mites/day on a sticky-board – in August are not maintained.

- Foraging bees are counted monthly.
- Colonies are inspected for disease in spring and fall, with additional inspections as needed. For example, if mite pressure is high, colonies are inspected for deformed wing bees. Presence of deformed wing drones is an indicator of a colony too sick to maintain.
- Because we are in bear territory, we periodically check our solar powered electrified fence and 'weed-wack' under the fencing.
- You may have noticed that tracheal mites have not been mentioned. Our tracheal mite infestation rate is so low that when someone is assigned the task of looking for these mites, he or she will begin to doubt their ability to find them when no mite has been observed after looking at hundreds of bees.

This plan is a work-in-progress because we have not achieved the level of colony sustainability we desire. Each winter we re-evaluate our success and change our plan as needed. Still, following this plan we have developed a set of colonies that have survived, untreated by pesticides or antibiotics, for seven years and counting.

Next month's CAP columnist is Dr. Marla Spivak at the University of Minnesota.

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The Traveling Beekeeper

Time for Resistant Bees-- Developing A Club or Bee Association Plan

by LARRY CONNOR
Wicwas Press
1620 Miller Road, Kalamazoo, MI 49001
LJConnor@aol.com • www.wicwas.com

A Model Agreement

The Beeville County beekeepers, seeking to reduce and ultimately eliminate the need for chemical treatments on our colonies and to improve the overall health of all honey bees in our area, agree to the following plan:

Year one

We encourage all beekeepers in Beeville County, the adjacent town of Pollenville, and an area delineated by a perimeter of six miles around this area (the estimated combined mating distance of queens and drones) to install queens of the following types in their colonies:

1. Queens resulting from the work of bee-breeding programs that have documented reduced mite levels (by known or yet unknown mechanisms of resistance, including hygienic behavior, grooming or physiological reproductive reduction).
2. Local survivor stock that is documented to have been kept without chemical treatment for five or more years.
3. Any colony that shows a low mite level when tested using a standard method.
4. The club will sponsor and promote classes and field days where general beekeeping techniques will be taught, involving queen finding, requeening, queen cell use, and use of swarm and supersedure queens from selected colonies.

Year two

We continue to encourage all beekeepers in the defined area to maintain bee colonies with the above characteristics. In addition we encourage the formation of—

1. Queen rearing classes
2. General instruction on evaluating swarm, supersedure and other replacement queens in an effort to obtain colonies with reduced mite loads.
3. A simple method of evaluating colonies for their mite load, using a standardized test to check for mite levels that does not negatively impact the productivity of the colony being tested.

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If you look over the above plan, it should strike you that this is simple and direct. If any bee club seeks to develop a low or zero level of chemical control in its hives and still have highly productive colonies, it is going to take a great deal of work. It also must have a near perfect level of participation by beekeepers in the area, whether they are members of the club or not. Simplicity is needed to make the program understandable and within the range of beekeeper skills for the area. This may include some over-reaching for many new and under-motivated beekeepers, as such

Queen cells from a small-scale operation. If clubs can promote and support local beekeepers producing resistant stock, they will quickly be able to convert to lines that carry resistance to varroa and tracheal mites, as well as bee brood diseases.

the plan should have a high level of teachability to make it work.

Queens and Bees for New Beekeepers and for Replacement Hives

All beekeepers starting with colonies in the first year of the program will need to have an easy local source of bees with resistant queens. This may require extensive work by the organizers to find queens and package bee suppliers and/or nucleus suppliers where the queen will carry genetic information that fits the scope of the plan. For new beekeepers and beekeepers wishing to increase their colony numbers, it will mean that queens from hygienic selection progams, or a mite grooming stock be identified and put into packages and nuclei. Look at sources offering Minnesota Hygienic, VSH, Russian and other low-varroa lines to offer to ALL beekeepers in the area.

This may get a bit difficult for two reasons. First, it may be difficult to find the numbers of queens of these types when beekeepers think they need them. This will certainly be a challenge for northern clubs that have traditionally taken delivery of package bees in April. There will be a limited supply of these queens, which seems to be a certainty. Second, there are undoubtedly some package bee distributors that have long-term arrangements with certain suppliers that may not routinely offer resistant stock. In that case it will be necessary to ask the package bee producer to graft queens from a resistant breeder source or lose the business. (Of course, these queens will NOT be mated to drones of the same stock, which will reduce the effectiveness of these queens). If the package bee producer cannot supply an acceptable queen, look elsewhere, and do it early. It may take a year just to set this part up and get it into operation, but I hope not.

Member Training

Starting in the winter months the club must offer programs that focus on the development of a high level of mite and disease resistant bees within the defined area. This will continue into the spring and Summer as the club offers a number of small-sized and highly manageable apiary programs where each beekeeper will be able to have the opportunity to find queens, install laying queens, virgin queens, and queen cells, and perform other basic beekeeping activities. This could be a monumental effort, and will require the cooperation of a number of member beekeepers who are willing to open their apiaries to fellow members and take the time to correctly teach these methods. Not all the host beekeepers have these skills, meaning that some effort will need to be spent teaching those who will do the final teaching. While new beekeepers need to be invited to these programs, existing small-scale and semi-professional beekeepers will be useful parts of the goals set out above if they are included in the teaching.

A series of March-June workshops with emphasis on hands-on training will provide a great deal of education. Some of these programs can be set up on weekend time slots, while others will work during the increasing twilight hours the spring provides. If some members can meet at 5 or 6 pm and have an hour session in the bees, it will get much of the work done before dinner.

Inserting a queen cell into a three-way nucleus at Miksa Honey Farms in Groveland Florida. Use of queen cells is common among commercial beekeepers, and suppliers like Dave Miksa and family will help fill the demand for high-quality, ready-to-emerge queen cells.

What to Teach?

Queen Finding—It is usually easier to find queens in smaller colonies coming out of winter compared to full-sized summer colonies. Colonies in March-April have the lowest numbers of worker bees they will have for the rest of the year, so it is usually possible to work through one hive body of bees and brood rather than several. The challenge will be to have a resistant queen to replace an over wintered queen. Plus, some will argue that those colonies that survive the winter possess some degree of adability to the area for their wintering ability, and should be kept alive. This falls into that vague 'judgment call' where the beekeeper who owns the bees makes the final decision. As nice as the above model is, it cannot force a beekeeper to make changes. The key is to provide education, not regulation! But as a teaching moment, working and training beekeepers to find queens in smaller units will generate more success than attempting the same exercise in June.

Requeen while making increase colonies—Some of you knew I would add this, right? An ideal time to use the stronger colonies in the hive AND to use mite and disease-free queens is when the colonies are approaching swarm time, and are full of brood, queen cells and bees. Now not everybody finds the queen in all of his or her swarm-seasons splits (and what works for you is fine with me). But the use of these cells from colonies with some level of resistance gives you a low-cost and remarkably effective method of producing new colonies that may be evaluated for mite resistance once the bee population has been turned over and is made of just the daughters of the new queen. Since such queens have mated locally to the drones they have found, expect to find a full range of variation in the level of resistance these bees demonstrate when tested. Some colonies may have very resistant behavior, while others may completely nonresistant. It is the testing component that is important to this process. If you act on above information, you are selecting a local stock!

Making nucs provides different numerical possibilities. You can pull out a nucleus hive from a strong colony every week or two when conditions are right. Or you can hit the colony hard when there are many queen cells and pull the strength down so there is little chance of swarming. Or you can divide the hive into three or four new colonies and completely eliminate the old hive. Face the entrances of the new hives toward the direction of the old colony and swap the strong nucs with the weak ones to equalize bee strength. Later in the summer you can repeat this process again. For each colony you start with, you may have 9-16 new colonies in September, depending if you do a 3X or a 4X increase each time.

In the context of this article, you have now made a rapid increase in the number of colonies, and if you use swarm cells from survivor or hygienic or Russian or VSH stock, or you graft from one of these sources, you have rapidly multiplied your colony holdings, and in doing so you have made a giant step toward more resistant

The USDA has introduced a number of queen families or strains from Russia that possess resistance to varroa mite. This USDA-provided photo shows the excellent brood pattern resulting from an intensive bee breeding program. The Russian stock has now been turned over to a group of beekeepers who provide the stock to others.

colonies in your area.

Requeening—In addition to the use of queens of a desired stock, you may be able to purchase queen cells grafted from a resistant stock. This method is described in my new book, *Queen Rearing Essentials*, and is commonly used in Europe and certain parts of the United States where commercial beekeepers split their hives. The biggest challenge is to get the queen cells when you want them. But if a bee club orders 100 or 1,000 queen cells from a commercial producer, it has the advantage of getting resistant queens at a much reduced price, as well as having some influence on the stock that is coming into the club's area.

Queen cells are commonly used by commercial/professional beekeepers when they make spring nucs or when they recycle colonies after a heavy pollination season. They are relatively low in price and easy to use. You do not have to raise queens to use queen cells, they are so easy to install that any new beekeeper can learn to do it after seeing it just once, and the drones used for mating are from the local area where the nucs are stocked, and not from a Sunbelt environment. This adds locally adapted genes, in theory.

The use of virgin queens offers another great opportunity. I have used virgin queens in nuclei over the years, and did so again last summer (2009) and was pleased with Florida-raised virgins installed into colonies in early August. The acceptance and take was very encouraging so this may be a method of getting queens of desired genetic type when the bees are easily divided for wintering that fall.

Clubs that attempt to control the genetics will need to do training. Here are some general thoughts:

1. Announce the plan in the local media. Say that the Beeville County Bee Club is working to develop a chemical-free system of keeping bees in the area, and explain how varroa mites and diseases force local beekeepers to use drugs and antibiotics each year. Be clear that this is not really an effort to become 'organic', but just chemical free in the colonies that you operate.
2. Invite all area beekeepers to attend training programs, regardless of membership. In fact, it could become a great time to promote the club and the benefits of participation in its events.
3. Show basic queen management and queening methods at these meetings, as outlined above.
4. Show how to measure mite levels with powdered sugar, and the advantage of doing so with a screened bottom board or a thin board inserted onto the bottom board. Come back in one hour and show everyone the mites that have fallen, and count them. If you had colonies sugared the previous day, you could show some 24-hr drops after power treatments.
5. Compare other methods of measuring mite levels, from the ether roll to the powdered sugar roll. Pull out drone comb and show the adult female mites, as well as the developing mites inside the cells. I purchased a low-cost dissecting microscope, so I can have samples set up under the scope lens specifically for the training of new beekeepers.

This plan is just a starting point. Each of you will build on this plan. In three or four years you should expect to see a definite change in the colonies, with both lower mite counts and lower levels of American foulbrood, European foulbrood, Sacbrood and Chalkbrood.

In March Larry Connor and Dewey Caron will conduct a four-evening Advanced Beekeeping Course in Comstock, Michigan, (near Kalamazoo). For information go to www.wicwas.com or LJConnor@aol.com. Use those contacts for information about Dr. Connor's three books in the Essentials Series: *Queen Rearing Essentials, Increase Essentials and Bee Sex Essentials.*

SURVIVOR DRONE PROJECT— DISPERSING HONEY BEE GENETIC DIVERSITY

by JOSEPH S. LATSHAW PhD.
Latshaw Apiaries
New Albany, Ohio
www.latshawapiaries.com

The term "survivor" imparts different meanings in different circles of beekeeping. In the strictest sense of the word, survivor, is delegated to colonies of bees that are able to perform their daily tasks unaided by the modern beekeeper's arsenal of techniques and chemicals. For others, the term survivor designates the lone colony standing in the spring despite all of the beekeeper's best efforts to preserve and enhance colony survival the year before.

For this article, I would like to offer a generalized definition of the term, survivor. A survivor colony is a colony of bees that not only survives, but thrives with minimal assistance from the beekeeper. Honey bees are very capable creatures and often fall prey to well-intentioned beekeepers. All of the challenges facing beekeeping have encouraged them to look for answers to hard questions related to what is best for the bees and how beekeepers can better assist the bees. My background is in the field of genetics and my approach may seem almost taboo to those of you who are true practitioners of managing and propagating "survivor stock". However, science and technology may offer some assistance to disperse the genetic diversity stored in the survivor stock populations around the US.

An increasing body of research is showing the value and importance of genetic diversity for colony performance and survival. One way to enhance genetic diversity, both within a single colony and collectively within a population is for queen honey bees to mate with multiple males. The use of traditional instrumental insemination mimics the multiple mating strategy to a certain extent; however, recent developments in the area of instrumental insemination facilitate greater genetic diversity. Early work with instrumental insemination led researchers to collect and pool large batches of honey bee semen in an effort to enhance genetic diversity. The large pool of honey bee semen, representing perhaps several hundred males, was then mixed/homogenized prior to inseminating the virgin queens. In essence, instrumental insemination allowed researchers to inseminate queens with sperm from many males through the use of mixed/homogenized semen. The techniques utilized to perform the semen mixing offered variable results due to the potential risks of sperm damage and contamination.

Recently, I revisited the concept of utilizing mixed/homogenized honey bee semen on a large scale to promote greater genetic diversity within the Aurea and Karnica strains that I maintain. Faced with the challenges of the original mixing/homogenizing techniques, I developed a new instrumental insemination instrument and Micro Syringe

Figure 1. Drone cages were cut from a 2x3 piece of lumber and holes were drilled into the blocks of wood to provide space for queen candy, a compartment for the workers and drones, and hole that doubled as a place to fill the drone cage and a holder for the sugar syrup container.

Figure 2. Shipping methods varied for each of the participants, depending on the distance the drones had to travel. For participants located a short distance away, drones cages were secured inside a Priority Mail shipping box. For greater distances, UPS overnight shipping was used to ensure a timely delivery.

Figure 3. A group of filled drone cages. As shipments arrived over a two-day period, the drones were transferred from their shipping cages into holding cages in queenless bank colonies. The drone holding cages provided greater access to the drones by the bees in the bank colony who then cared for the drones until their semen was collected the following day.

that provides a large mixing chamber for the semen as it is collected from the drones. Essentially, the semen is gently mixed as it is being collected, eliminating the need for centrifugation or mechanical mixing outside of the syringe which may cause damage to the sperm.

After employing the newly developed Micro Syringe in my breeding program, I began talking with other beekeepers, specifically those interested in propagating survivor stock. Such beekeepers offer two very valuable resources. One, they use very little in the way of treatments to manage their bees. Two, they are often very resourceful at preserving genetic lineages specific to their locality. In other words, they often have fairly isolated and preserved populations that may possess some very beneficial characteristics. My goal in talking with beekeepers who in one sense or another classified themselves as propagators of survivor stock or who have access to survivor colonies was to mix up the gene pool and redistribute some of the genetic diversity preserved in their bee yards.

My initial thought was to purchase queens from beekeepers around the US who were interested in participating. I then remembered seeing large "queen" cages that were used back in the early days in conjunction with instrumental insemination. The large "queen" cages were actually designed so that beekeepers could ship their virgin queens, along with a sampling of drones, to an instrumental insemination lab to be inseminated and then returned. Since I was only interested in the drones, I decided to build a drone cage for shipping drones, along with some attendants to ensure the drones were kept warm and fed. I then asked the participating beekeepers if they would be willing to ship me a selection of drones from some of their best colonies. The project required precise coordination of shipping from each of the participants from around the US. It was important to have all of the drone shipments arrive within a day or two of each other.

Drones are more fragile than queens or workers and do not tolerate shipping conditions as well. Therefore, a specially designed cage, measuring approximately 3"x 5" x 1.5", was made. After some initial trial runs, it appeared as though 75 workers and 20 drones was the ideal proportion for the shipping cage. Each cage consisted of two large holes for the drones and workers, with two smaller holes located at one end of the cage to provide candy for the bees to eat while in transit. In addition to the candy, the hole used to fill the cage with workers and drones was fitted with a small vial of sugar syrup. The sugar syrup provided a valuable source of water for the workers and drones while in transit. The use of candy and syrup seemed a bit excessive, but I wanted to make sure the drones traveled very well.

I asked each participant to select their own shipping company to ensure a timely arrival. As the drones arrived, they were removed from their respective shipping boxes and fed with a little bit of honey on the screen of the drone cage. The drones were then transferred from their shipping cages into a second cage that contained queen excluder material on each side of a small wooden frame. Drones from all of the shipments were consolidated into two larger cages which were then placed in a queen-less bank colony well stocked with young nurse bees and fed sugar syrup. The purpose of consolidating the drones was to allow the drones to recuperate as soon as they arrived over the course of a two-day period and to mix the drones from the various participants. Keep in mind, the objective here was to mix up the gene pool not propagate any one particular line.

Once all of the drones arrived and had a chance to recuperate, it was time to begin collecting semen from all of the drones. Drones were brought into the lab and their semen was collected using the new Micro Syringe. The collected semen remained in the syringe for another 24 hours after collection to facilitate additional mixing of the sperm cells. All of the drones produced enough semen to inseminate approximately 12 queens.

The following morning, I selected 12 virgin queens from some of my most productive colonies that have required little or no treatment over the past couple of years. Each of the virgin queens was inseminated with 10 microliters of mixed semen from the drones. After the insemination procedure, the newly inseminated queens were introduced into nucleus colonies. Approximately 7-10 days after the insemination procedure, the queens were checked for the presence of eggs. Most of the queens already had a nice pattern established, but a couple of the queens were lost during introduction. Introducing newly inseminated queens can be a bit tricky. It is a mix between introducing a

Figure 4. Once all of the drones arrived and had a least 24 hours to recover in the bank colony, semen was collected from all of the drones and mixed using the Micro Syringe. The pool of drone semen was held overnight to facilitate additional mixing of the sperm and used to inseminate queens the following morning.

mated queen and a virgin queen. However, once the newly inseminated queens began to lay eggs, they were treated much the same way you would manage a naturally mated queen.

Just as soon as the first eggs from the "super-mated" queens began to hatch, I started grafting the next generation of daughter queens! The resulting daughter queens would produce hundreds of new genetic combinations resulting from the genetic makeup of the queen and the drones used to inseminate each queen. Keep in mind each queen was essentially mated to a small sample from each drone that contributed semen to the mix. Therefore, her daughters represented a sampling from the diverse genetic background.

In exchange for sending me drones from their top survivor colonies, each of the participants were sent two daughter queens inseminated with mixed semen from some of my top performing colonies. Again, the concept of this project was to mix up the gene pool by establishing as many new genetic combinations as possible. Each participant could then raise daughter queens from their inseminated queens. Only time, evaluation, and records will reveal which of the new genetic combinations are worth propagating. In addition to the daughter queens shipped to each of the participants, I established a group of daughter queens in nucleus colonies and allowed them to build up for winter. Each new queen and her colony will be monitored during the coming season.

As with any breeding program, the key to making progress with selection efforts is time and detailed evaluation. However, genetic diversity provides the building blocks for genetic selection. With an ever changing environment, it can be quite a challenge to predict which traits may prove to be beneficial in the future. Preserving and distributing the genetic lineages that have been propagated by diverse breeding programs is beneficial for the beekeeping community. The *Survivor Drone Project* is an example of how technology can work in conjunction with the honey bee's mating strategy to foster and enhance the distribution of genetic diversity.

Acknowledgements: I wish to thank all of the generous beekeepers around the US who graciously contributed their time and stock to this project. This project would not be possible without their dedication and attentive beekeeping.

The Economy of the Hive

Part II

by RANDY OLIVER
ScientificBeekeeping.com

Last month I described the functions of the main players in the hive economy—the queen, the nurse bees, the foragers, and the "resting" bees. Now let's look at the main driver for the bee economy—the supply of food.

The honey bee economy is based upon the gathering and consumption of four resources (nectar, pollen, propolis, and water), the processing, distribution, and consumption of those resources, and the production of waxen comb, honey, beebread, and bees. The smooth working of the economy is governed by the exchange of information between the bees performing the various tasks.

The bee economy booms each spring, and contracts each winter. Following a good year, it can celebrate by throwing off a swarm the next spring. However, in poor forage years, or when in battle with parasites, the colony will go to extreme measures to try to survive. Even in an average year, the colony must constantly adjust to changing conditions. I asked Dr. Tom Seeley if I could use one of his graphs to illustrate the erratic input of nectar flow to the hive economy, and the effect of its major output-swarms:

The graph clearly shows just how tenuous is the existence of a bee colony. ***There are only a few weeks out of an entire year in which the colony actually gains weight!*** Note how quickly the colony regains its population after swarming, but also the loss of weight that week. In contrast to the timing of the "flows" in Seeley's East Coast location, in my arid-summer California locations the colony puts away the bulk of its winter stores in the few weeks from mid May until the end of June—the rest of the year it is largely in survival mode, due to the limitation of resources by cold, rain, or late summer drought. And to add further challenge, during the middle of that short productive period it must deal with the toxicity of the pollen and nectar of the buckeye tree! In order to conserve resources in dry years, some colonies (especially the Russian stocks) go into a broodless resting state in late summer.

Practical Tip: Make a rough graph similar to the one shown here for your area. Any portions (other than when colonies are in winter cluster) that the bars dip down for more than a week or so might be appropriate times to feed syrup and/or pollen supplement—especially if there is poor forage prior to the main flow.

The bases of any economy are food and energy. For bees, "food" mainly means pollen. Energy comes from the sugars in nectar, which bees have the amazing ability to convert into stable honey, which they store for lean times (both for metabolic energy and as fuel to heat their house). Because nectar intake in excess of the colony's needs happens so rarely, whenever an easily gathered surplus becomes available (a "honeyflow"), the colony is primed to drop everything else and focus on nectar collection and processing.

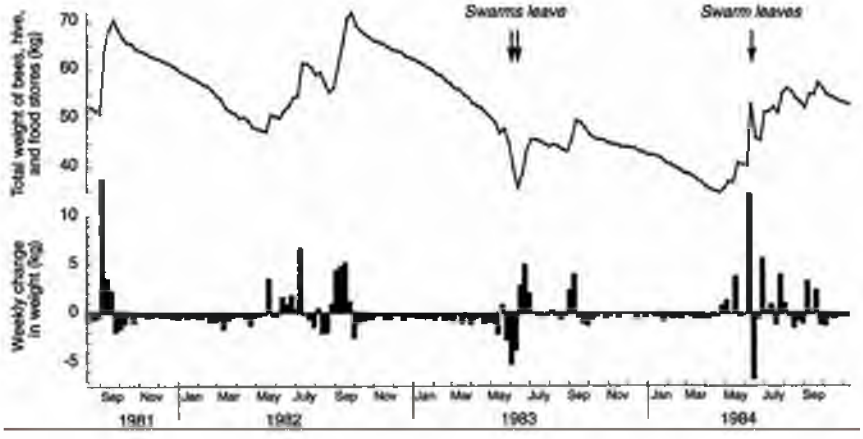
During strong flows, the colony will crowd the broodnest with nectar, and all hands (depending upon their abilities) get involved in the collecting, processing, comb building, and storage of the precious liquid. The nectar and honey aspect of the bee economy is generally well understood by beekeepers, so I am not going to elaborate on it further.

Of much greater import to the bee economy is the main food: pollen. Pollen is the source of precious protein (necessary to build the bees' bodies), of lipids, sterols, vitamins, and minerals. And whatever necessary nutrients are not found in raw pollen, the bees, with the help of their symbiotic microbiota, create in the alchemy of the fermentation of beebread.

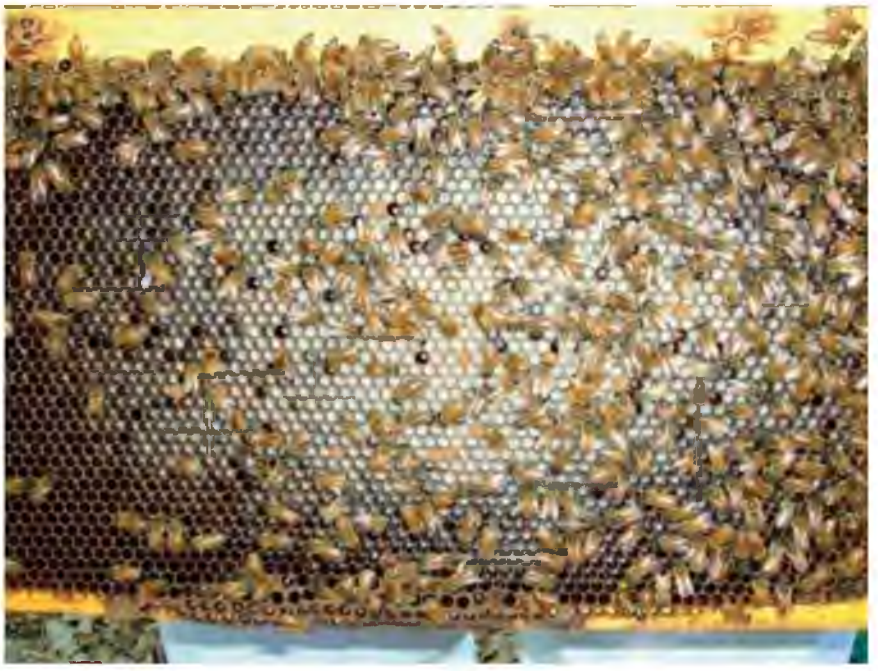
But pollen alone is too bulky and crude a food for the ravenous hunger of the queen, who may lay nearly her body weight in eggs each day. She could not possibly eat and digest enough pollen daily to fulfill that task! So she depends upon a royal diet of jelly fed to her, predigested by the nurse bees.

An even larger appetite is that of the voracious brood, each larva of which must eat enough to increase its weight by a factor of about 1700 in a little over 5 days (that would be like a 7 lb human baby growing to the size of a 6-ton elephant in 5 days!). And if that weren't enough, drones and foragers eat little pollen—so they also depend upon the nurse bees to feed *them*!

As far as I can tell from the literature, it appears that neither the queen, the larvae, drones, nor older workers digest pollen to any extent themselves, but are all dependent upon nurse bees (from about 3-15 days old) to feed them jelly (the adults are able to serve themselves nectar and honey). ***Indeed,***



A three-year record of weekly weighings of a honey bee colony. Bars above the line indicate that the colony gained weight that week; bars below indicate that the colony lost weight. Note just how few weeks in any year that a colony actually gains weight! Courtesy Dr. Thomas D. Seeley (1995) *The Wisdom of the Hive*.



Nurse bees must supply the hungry brood with frequent feedings of protein-rich jelly. In a well-nourished colony, a fecund queen can lay enough eggs to fill the equivalent of a side of a deep comb every day.

A queen larva afloat in a deep pool of royal jelly. Bees do not defecate as larvae, so can thus rest directly in their food, breathing through the exposed spiracles on the upper side of their body. The jelly is a "perfect food"—no other source of nutrition is necessary!

the foragers of a colony sometimes require as much jelly as do the brood (Schmickl and Crailsheim 2004).

Practical Tip: Lack of pollen indirectly affects the health of the workers as well as restricting brood production.

Practical Tip for queen producers: drones need to be fed with plenty of jelly for several days after emergence in order to develop their flight muscles and mucus glands. Queens also need to be "fattened" after emergence in the nucs. Queens mated in protein-hungry nucs, or those lacking young nurse bees may fail prematurely (Dr. Denis Anderson, per comm)!

This conversion of pollen into protein-rich jelly is really the essence of bee economics. The jelly is the true currency of colony wealth. When pollen is abundant, colonies are awash in jelly, and vigorously rear brood, produce drones (any time of year), and may swarm if the season is right. When pollen is temporarily scarce, the nurse bees may practice "deficit spending," and actually borrow protein reserves from their own bodies in order to feed the queen and brood.

Should protein become even scarcer, the nurses will cannibalize drone brood, eggs, and young worker brood (in which they have invested the least resources), digest out the protein, and recycle it back into jelly. And in extreme circumstances, the nurses will hoard the remaining protein in their bodies, and become the aforementioned diutinus, or "winter" bees.

Practical Tip: Workers which develop as larvae during pollen dearths may have food withheld, and thus be compromised in later life—beekeepers should be aware of this delayed effect.

I strongly recommend that the serious beekeeper read about the protein dynamics of the hive in a fascinating review by Schmickl and Crailsheim (2004), which is a free download. The authors detail how bees use jelly to distribute and share (or restrict), protein reserves in a colony through the process of trophallaxis (the exchange of food from bee to bee). This trophallactic sharing of food is the basis of the social structure of the colony. Indeed, newly-emerged bees beg for an inoculum of jelly and beneficial bacteria from nurse bees in order to prime their sterile gut.

So what about this vital (and aptly named "royal") jelly? It apparently evolved from the saliva of the bees' meat-eating ancestors. By converting the essential nutrients of bulky pollen into a concentrated jelly, the nurse bee is able to feed a purified, sterilized, and highly digestible food to the queen and larvae, thus eliminating the huge amount of poop that would otherwise be discharged inside the hive by them (Webster and Peng 2002). So perfect is jelly as a food, the queen's excrement looks like water!

Jelly is produced by the hypopharyngeal glands in the bees' heads—the protein mobilized via their "blood" from stores of vitellogenin in the fat bodies and ovaries. Vitellogenin (vitello = yolk; gen = producing) is a universal egg yolk precursor that has been adopted by the functionally sterile female worker bees to be used as a storage protein.

Equally important, Drs. Page and Amdam have published several papers on how vitellogenin can actually change the physiology, behavior, longevity, and immune function of bees (see my Fat Bees articles). (Beekeepers benefit from the Page lab's research in gerontology (the study of aging), for which bees have become a model organism. It's easier to find funding if you have a chance at discovering a human "fountain of youth".) A recent paper (Li 2009) demonstrated that vitellogenin also kills bacteria—which may help to explain why low-vitellogenin bees are more susceptible to disease.

Since the economy of the hive is funda-

mentally based upon colony nutrition, especially with regard to protein, the main commerce in the hive is that of foodstuffs—nectar, honey, and jelly. (Raw pollen is gathered, prepared, and stored by individual foragers, and not much "traded.") If we think of honey as being the wealth and savings of a colony, then jelly is the lifeblood, and the measure of its immediate financial state.

The immediacy is due to the fact that relatively little pollen is stored in the colony at any time, so the bulk of protein "savings" are the reserves within the bees' bodies. (However, Otis (2004) did find that stored beebread was necessary for winter brood rearing in Canada prior to natural pollen flows).

Practical Tip: When the colony is actively rearing brood, all the pollen reserves can be completely used up during a few days of rain. At that point, the nurse bees must dig into their body reserves, and brood rearing is constrained. In order to prevent a loss of "momentum" in colony buildup, the beekeeper may wish to supply pollen supplement during inclement weather.

Therefore, it is not surprising that the main means of communication within the hive about the state of its economy is by the trophallactic sharing of nectar/honey and jelly. Thus, jelly is not only nutriment, but also functions as a currency, medicine, a means of communication, a reservoir of wealth, and as the main sustenance of the queen, brood, and foragers (along with nectar). The health and vigor of the bee economy is predicated on the abundance and flow of jelly from the nurses to the rest of the bees in the hive.

The sharing of royal jelly is the communion that holds the bee society together. It is the means by which a colony "thinks," monitors its nutritional state, and regulates its homeostasis. To the bee, jelly is the fountain of youthfulness, health, and vitality. Understand the significance of jelly, and you will understand the soul of the bee colony.

Schmickl and Crailsheim point out that the center of colony communication is the brood nest. The brood nest is the "trading floor" for the bee economy, where exchanges of protein, sugars, and pheromones are made. And centered in the brood nest is the heart of the colony—the queen. The brood nest functions as the "blackboard" for the posting the current status of the economy, and as a record of what has transpired over the previous weeks.

Practical Tip: A thoughtful inspection of the broodnest provides the beekeeper with a record of what has transpired in the hive's economy over the previous weeks, a report on its current status, and a prediction of its future.

In my next article I will discuss colony communication and sharing of the wealth.

Protein is transferred throughout the colony via trophallaxis (food sharing). Only nurse bees produce jelly, and feed it to the queen and drones, the brood, and the very young and older workers. This "communion" allows the communication of the current nutritive state to all members of the colony.

Not Rocket Science

Beekeeping has a long history of challenges, die offs, and debate about management practices. We now have at our disposal fantastic advances in scientific tools—polymerase chain reaction (PCR) and gene sequencing that can dissect the genome, pesticide testing to the parts per trillion, data-crunching computers and statistics that can make your head spin.

But when it comes down to applications that the beekeeper can actually practice in the field, the science is generally pretty simple, and often initiated by beekeepers themselves. There are a lot of ingenious beekeepers in the world, and kind of like the proverbial monkeys on typewriters, they are bound to figure things out by plain trial and error. Afterward, scientists can enter to set up trials to collect the data necessary to separate effective treatments from chance, and to use laboratory instrumentation to determine the molecular or physical mechanisms involved.

My readers certainly see the great appreciation and respect that I have for the world's bee research scientists. However, beekeepers often have practical questions that could be answered by simple, field trials and data collection. Unfortunately, many of these small research opportunities simply drop between the cracks, either because the funding organizations can't respond quickly enough, or because such research doesn't look "sexy" enough on a postdoc's resume.

There is no reason that any diligent beekeeper can't ask a local community college professor to help him or her to set up a controlled (having a control group) trial using the scientific method. Luckily, much of this research would involve nothing more than equalizing test colonies, applying treatments or biotechnical methods, and then counting mites or spores, weighing hives, visually measuring "frame strength," or recording survival. Valuable information often could often be obtained by any small-scale beekeeper willing to enroll a couple dozen colonies in a trial.

I always have more trials in mind than I have the time or means to perform, so I'm asking for help. I'd be glad to offer assistance in experimental design to any beekeeper or club willing to diligently collect data, and I will help you to write up the results for the benefit of all. Alternatively, any group that wants to contribute some money for practical bee research can let me know, and if I have, or hear of, a small project needing funding (usually in the few hundred to few thousand dollar range), I may approach you to see if you wish to support it.

I truly feel that many of our challenges in beekeeping can be solved by simple management practices based upon the results of small, practical research projects. Beekeepers have a long history of figuring out ways to survive every new problem. I'm suggesting that beekeepers rise to the occasion, and add to the body of beekeeping knowledge by engaging in citizen research, and sharing the results for everyone's benefit! Let me know if you are interested.

Acknowledgments

As always, I am deeply indebted to my collaborator in research, Peter Loring Borst. I also appreciate the generosity of Drs. Zachary Huang, Rob Page, Gro Amdam, Heather Mattila, and Tom Seeley, who took the time to answer my questions and share unpublished research.

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Mortality in Tracheal-mite-infested Colonies and the Role of Thermoregulation

by JOHN McMULLAN, PhD*

Tracheal mites are arguably the most controversial parasite in the history of beekeeping. Considered by some as not a serious threat, others have stressed the mites' potential to kill colonies. Recent research has identified that tracheal mites can kill as a single parasite and that lack of thermoregulation is the critical mechanism involved. In this article the author gives the background and also offers beekeepers a non-chemical management option. The author further suggests that biological sciences on their own are not sufficient to provide an understanding of honey bee colonies and their response to disease, and that bee scientists need to incorporate the physical sciences into their work.

The condition in honey bee colonies that we now know as tracheal-mite infestation was first recognized on the Isle of Wight, just off the south coast of England about 1904. It was not until December 1919 in Scotland that the tracheal mite, *Acarapis woodi*, was first identified (Rennie *et al*., 1921). Yet there was no general acceptance that the mite caused the condition and widespread colony deaths, and this doubt has accompanied the parasite to the present day. The mite has since spread throughout the beekeeping world with the major exceptions of Australia and New Zealand.

One of the last places for the mite to arrive was North America. It arrived in the US in mid 1984 and crossed the border into Canada in 1986. Widespread colony deaths followed its arrival and while the mite is endemic, chemical treatments and improved bee resistance have reduced the level of mortality today. Global figures on the level of tracheal mite infestation are difficult to obtain due to the time/cost involved in detecting the mites (Figure 1). However, figures are available from two recent studies on CCD in the US with 24% colony prevalence in Cox-Foster *et al.* (2007) and 22/43% in vanEngelsdorp *et al.,* (2009).

It has recently been established that the mechanism causing colony death is the inability of the colony to thermoregulate (McMullan and Brown, 2009). This article gives the background and a brief description of the mortality model involved and based on the model proposes a non-chemical management option for beekeepers.

* **John McMullan Ph.D.**
Research Associate
Department of Zoology
School of Natural Sciences
Trinity College Dublin
Dublin 2, Ireland

Fig. 1. A honey bee with tracheae exposed showing unilateral infestation. The left trachea, to the right in the photograph, is damaged by the tracheal mites when feeding. Dissecting bees is the only way to establish the mite prevalence in a colony, and it is time consuming and costly.

Fig. 2. These bees have left the hive on a sunny day in the late winter/early spring and will die in the late afternoon huddled on grass stalks. If the bees are collected, put into an incubator at 32ºC and fed sugar syrup they will live for many weeks.

Mortality in tracheal-mite-infested bees

Mortality in individual bees varies with the season. While summer bees infested with the tracheal mite have a similar life span to uninfested bees, in winter conditions infested bees in the colony die sooner (Bailey and Lee, 1959; Gary and Page, 1989; Bailey, 1958, 1961). Infested bees have degeneration of the flight muscles (Komeli and Ambrose 1991) and have a reduced metabolic rate (Nasr *et al.*, 1999; Harrison *et al.*, 2001). An in-depth study in Canada (Skinner, 2000) showed that individual bees that were highly infested had a significantly reduced oxygen consumption even at relatively high temperatures.

At colony level Bailey (1961) demonstrated that in temperate climates where mite prevalence was over 30% in the autumn there was a significant increase in winter mortality. Also, in Canada it was shown that colonies with high mite prevalence had a three times higher winter mortality than low prevalence colonies. Winter mortality, however, appears to be dependent on geographical location. In sub-tropical locations tracheal mite infestation can be high with little apparent affect on mortality. This was the case in the southern states of America while in the northern states mortality was common (Eichen, 1987, Otis and Scott-Dupree, 1992).

What causes infested colonies to die? Adam (1987) believed that tracheal mites on their own can kill bees and that clinical signs are only displayed a short time before they die. Bailey (1985, 1999) on the other hand maintained that chronic bee paralysis virus (CBPV) caused the rapid death of affected colonies and that the mite was not a vector for the virus. This contrasts with the more recent experience in the US and Canada. The mite was first discovered in the US in mid 1984 after many years monitoring colonies for its presence and shortly afterwards colonies started to die. Studies that have been undertaken in Ireland show that colonies with only tracheal mite infestation can die with no presence of CBPV detected by either clinical signs or molecular analysis. Over the years establishing the cause of death has undoubtedly been confounded by the presence of other pathogens. When colonies die out in the late winter/early spring period the bees generally leave the hive on a sunny day on a cleansing flight that becomes a cleansing crawl, and in the late afternoon perish clutching onto grass stalks (Figure 2). There is evidence that the number of bees leaving the hive on a particular day is correlated with the level of sunshine and not the ambient temperature of the day (J. McMullan, unpublished data). I have on a number of occasions collected these bees from the grass, put them into an incubator at 32ºC and fed them with sugar syrup. The bees live for several weeks, not the rapid death associated with CBPV.

Colony thermoregulation

The characteristic that most distinguishes the honey bee from other species in the insect world is its ability to strictly control temperature and humidity. Individual bees have a limited ability to heat themselves due to their disproportionately small body and to overcome this they form a cluster (Southwick, 1991). The surface area per bee in a winter cluster is about one-thirtieth that of an individual bee (Seeley, 1985). Hence wide variations in ambient temperature can be compensated for by a healthy colony to maintain a cluster temperature between 34ºC and 35ºC, when brood is present (Figure 3). They generate heat by using their wing muscles to 'shiver' to maintain core cluster temperature (in conjunction with varying cluster size/surface area) and to raise thorax temperature for flight. Tracheal-mite infested bees have a reduced ability to use their wing muscles to generate heat and this feature combined with a number of characteristics of the infested colony in winter, has a cumulative influence which in particular circumstances can result in the demise of the colony. Using published data, a mortality model can be developed to explain the behavior of a tracheal mite-infested colony during winter conditions.

The mortality spiral

During winter conditions the honey bee colony is a closed energy system where chemical energy (honey stores) is used to meet the heat losses of the colony (and maintain colony temperature) and to feed any brood present. In the case of a colony infested with tracheal mites, colony behavior can be represented by a spiral showing how a number of influences come together, and in specific circumstances can progressively drive the colony downwards to its death. The mortality spiral is shown in Figure 4. The outer loop, nodes 2-4, identifies the increased demand on the colony to increase its heat output per bee while the inner loop, nodes 5-6, identifies the reduced ability of the colony to increase its energy output per bee. These influences culminate at node 7 and move the colony toward a situation that may result in temperature stress. Increased mite prevalence and reduced bee population, nodes 8-10, will tend to push the colony towards increased temperature stress and depending on the prevailing conditions can drive the colony in a spiral towards its death.

The mortality spiral starts at node 1 with a tracheal-mite-infested colony in the late autumn/early winter period.

Outer loop (nodes 2-4). Using data from the Eischen (1987) study shows a reduced brood cover (ratio of bee population to brood) in infested colonies demonstrating a demand for increased heat energy output per bee. The reduced brood in infested colonies (Otis and Scott-Dupree, 1992) and hence the relative reduction in bee population along with the increased heat losses through looser clusters (Adam, 1968) further demonstrates a demand for increased energy output per bee.

Inner loop (nodes 5-6). The reduced ability of infested colonies to use their wing muscles to produce heat by 'shivering' (Komeili and Ambrose, 1991) results in reduced heat energy output per bee. Also the increased stores consumption per bee in infested colonies (Eischen, 1987) would be directly related to the increased demand for heat energy (outer loop), and would be further increased by the reduced efficiency in metabolizing the honey stores.

Nodes 7-10. Healthy colonies have no difficulty in regulating the cluster temperature (Figure 3). However, infested colonies in winter conditions under the combined effects of an increasing need to improve heat output per bee (outer loop) and a reducing

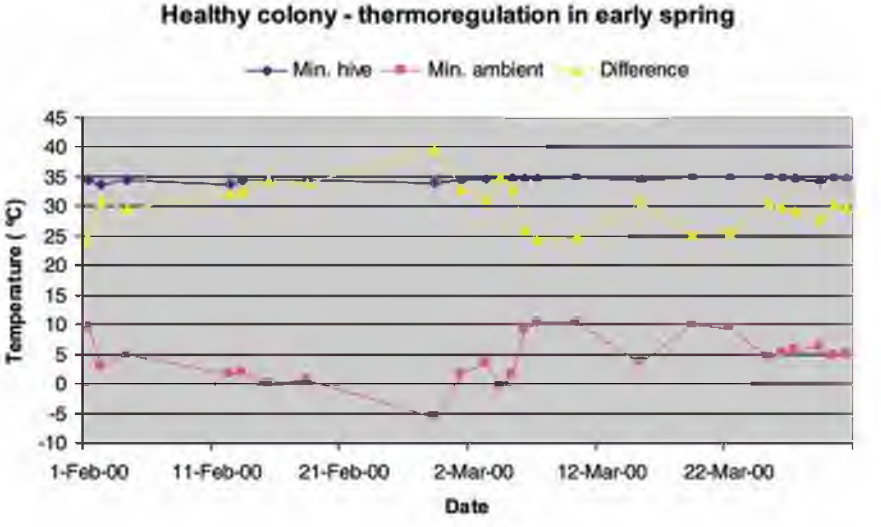

Fig. 3 The graph shows the thermoregulation in a healthy colony during winter conditions in a temperate region. This colony keeps the core-cluster temperature between 34ºC and 35ºC even when the ambient temperature drops to -5ºC (23ºF), a temperature differential of 40ºC (72ºF)

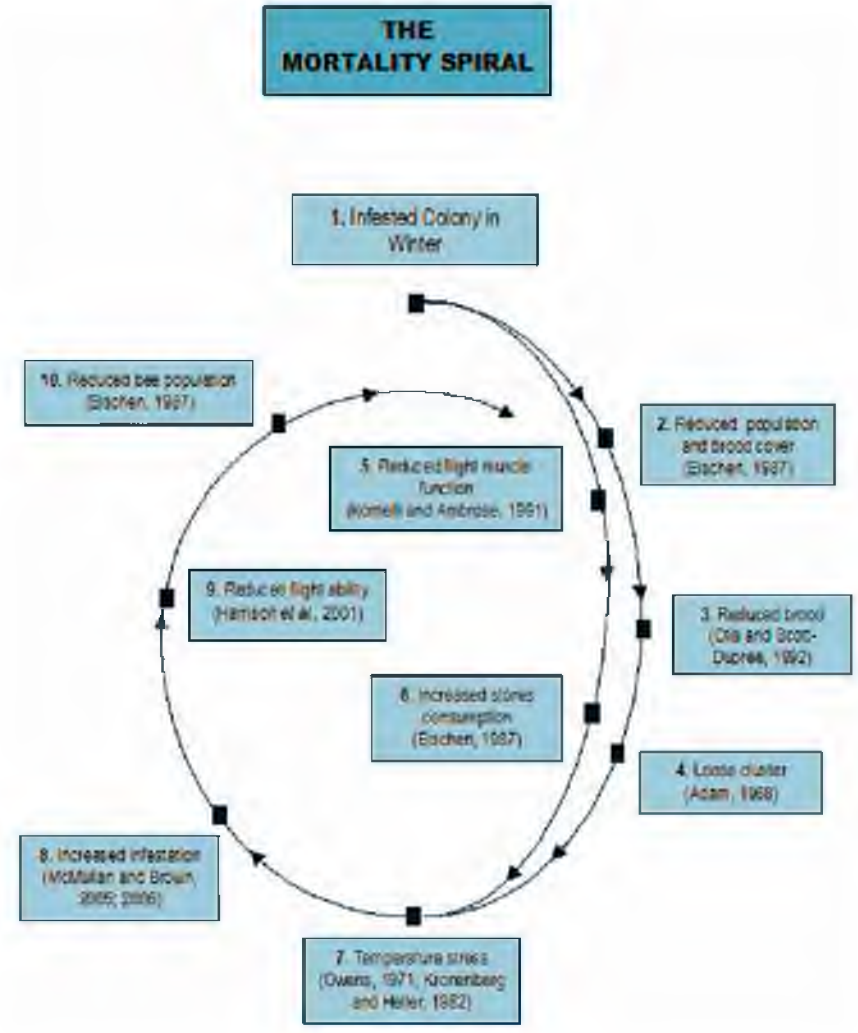

Fig. 4. The 'Mortality Spiral' showing the dynamic influences on a tracheal-mite-infested colony during the winter/early spring period. In mortal decline, the superorganism that depends on scale for its existence will lose its cohesion and spiral downwards under the many factors that aggregate and bring the colony to its death.

ability to increase its heat output (inner loop) may reach a situation where it is unable to maintain normal core cluster temperature. The temperature may have to fall to maintain the energy balance. It has been demonstrated that tracheal-mite infested colonies during their decline will maintain the cluster temperature at reduced levels (J. McMullan, unpublished data). Reduced pupation temperature will increase the susceptibility of the emerging bees to the mite (McMullan and Brown, 2005; 2006). The increased mite prevalence levels will in turn further reduce flight metabolic rate and their ability to fly and to return safely in winter conditions (Harrison *et al*., 2001). This can result in dramatic reductions in bee populations. Also, the increased honey consumption by infested bees will increase the need for cleansing flights and further increase the loss of bees outside the hive.

It can be seen that several factors come together and the superorganism, honey bee colony, that depends on scale for its existence, will lose its cohesion and progressively spiral downwards to its demise. A heavily infested colony in winter conditions can die out in the late winter/early spring period (Figure 5), the critical mechanism being the colony's inability to thermoregulate. The outcome for the colony depends on the degree of infestation, the strain of bee, the level of hive insulation and winter climate.

A non-chemical treatment option

It has become common practice to use chemicals to control tracheal mite infestation. Menthol crystals, formic acid and thymol-based products are some of the measures used. As in the case of varroa mites, the tracheal mites will not all be removed and the treatments can only be considered a temporary measure or short-term approach. The only long-term approach is to use a queen with offspring that show good resistance to the mite, as resistance is largely

Fig. 5. The photographs show dead bees on adjacent frames of the brood box after the colony has died out. Dead bees would typically be scattered over several frames, indicative of the loose clusters that prevail in tracheal-mite-infested colonies. (a) The left photograph shows the dead worker bees surrounding the queen identified by a white spot on its thorax. The workers would generally be bilaterally infested and the queen not infested. (b) The right photograph shows dead bees on a frame with some sealed brood and even some eggs in the cells to the right. Note the dysentery staining on the wings of the bees in both photographs.

Fig. 6. A heavily tracheal-mite-infested colony (prevalence >50%) in autumn, with bees returning to the hive loaded with ivy pollen and having normal behavioral traits. This colony can give an above average honey crop, have large bee populations and brood areas in the autumn yet die out in the early spring.

dependent on the ability of the bees to autogroom (Danka and Villa, 1996; McMullan and Brown, 2006). Therefore, a strategy for the beekeeper is to take the necessary action to ensure that the colony survives the winter and then to requeen with a resistant strain. Early detection of the presence of tracheal mite infestation, through dissection (Figure 1), is required as there are no clinical signs in the autumn, and when the bees start to crawl in the late winter/early spring it will be too late. Even highly infested colonies can behave normally, bringing in late pollen and having large bee populations and plenty of brood (Figure 6). An option that can be used if the mite prevalence is moderate (say >10%) is to winter wrap in the autumn after ensuring that other diseases are controlled, in particular the varroa mite (Downey and Winston, 2001). This involves the use of simple insulating materials that are cheap and re-useable (Figure 7). Wrapping is already used as a standard practice with healthy colonies in some geographical locations that have severe winter climates. The wrapping will assist the infested colonies to keep warm. Remember, these bees only require heat to stay alive as in the example that I gave earlier of infested bees that crawl out of the hive in late winter/early spring. These bees will live for many weeks in an incubator when thermoregulation is provided externally.

The winter wrapped colonies in the springtime will have an advantage in temperate climates in having their brood nests develop more quickly. The resistant strain to requeen these colonies may come from bees within the beekeepers own locality as there can be a wide spread in grooming ability within local colonies (McMullan and Brown, 2006). It is likely that the practice with large-scale operators would be to let infested colonies die out in the spring and replace the colonies. Small-scale operators, on the other hand, are an important and often neglected beekeeping constituency and can represent a large proportion of the beekeeping community. These small-scale beekeepers would tend to have limited beekeeping resources and would have less flexibility in replacing colonies than larger operators. For example, where all their colonies are in one apiary an infestation of tracheal mites could wipe out all their stocks. Early diagnosis of the presence of tracheal mites and winter wrapping could provide these beekeepers with a important management option.

Other diseases and CCD

A final word about the application of this systems-approach to other honey bee diseases and conditions. The model identifies key factors in the dynamics of a colony that is unhealthy and in decline. Biological sciences cannot fully describe this behavior and the application of physical sciences is necessary. In the recent investigations into the CCD phenomenon I have not been aware of any papers dealing with the thermodynamics of affected colonies. It is worth remembering that a key characteristic that distinguishes honey bees from other insects is their ability (and necessity) to strictly control core cluster temperature. Have temperature movements or the metabolic rates of bees in CCD affected colonies been studied? We know that bees that are pupated at a lower temperature have reduced cognitive ability and have impaired bee dances and could be severely restricted in returning to the hive (Tautz *et al*., 2003). As bee scientists, if we are to fully understand the behavior of colonies in abnormal conditions, as well as normal conditions, we need to use the tools that are required to do the job, not just the tool that we are used to or that we like to use.

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Fig. 7. Winter wrapping of beehives is proposed as a management option for small-scale beekeepers with tracheal-mite-infested colonies. The objective is to keep the colonies alive and building up well in the spring and then to requeen with a resistant strain. (a) The left photograph illustrates the low-cost insulating materials on a hive that has the roof insulated. (b) The right photograph shows the insulating material enclosed in waste bags, sealed and taped to the hive.

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The History of Beekeeping in Alaska

Part 1 of 2

by STEPHEN PETERSEN
Apicultural Consultant
akbeeman2000@yahoo.com

Introduction

Probably the first thing I learned while delving into beekeeping history was go to the source – not only can you read accounts firsthand, but often a more complete picture emerges and snippets of information can be gleaned; if anything perhaps more questions will be raised. Another aspect is to be leery of oft-quoted sources (especially the Internet); their intentions may be honorable, but they may not be substantiated - go to the source!

Rule number three – stay focused! While perusing issues of old bee journals it's easy to get side tracked; e.g. while thumbing through a 1968 issue of *American Bee Journal* I ran across an article about a Peace Corp volunteer from Texas in Afghanistan; now the Kentucky National Guard is currently involved in a beekeeping development program over there – under much different conditions. Then there was the… you get the idea.

First Introductions – 1900, Sitka; Father Methodius - Alaska's first beekeeper

The first documented introduction of honey bees to Alaska appears in Appendix I of the1900 Annual Reports of the US Department of the Interior written by Father Methodius to then governor of the Territory of Alaska, John G. Brady (Methodius 1900);

APPENDIX I.

PARSONAGE OF THE GRECO-RUSSIAN CHURCH,
Sitka, Alaska, September 1, 1900.

Sir: In compliance with your request I have the honor to submit herewith the result of my first year's experiment in apiculture in Sitka, Alaska.

On May 31, 1900, received from Seattle, Wash., two hives with two swarms of bees at the cost of $25. These hives I placed in the yard adjoining the parsonage, and up to June 20, 1900, the bees increased to two or more swarms, and on the 28th of same month two more swarms were added with a satisfactory result.

My experience during the summer showed that apiculture in Sitka is not only possible, but also profitable, as there are an abundance of nectariferous wildflowers and plants, also some vegetable gardens, and the experimental grounds of the agriculture department where buckwheat, clover, and various plants are raised, which furnish sufficient food for the bees. I noticed that during the hot, bright summer days a swarm of bees brings more honey than in Russia near St. Petersburg where apiculture is highly developed.

The season was not favorable for the apiculture industry, as the bees worked not more than 15 days from June 1 to September 1. The old swarm of bees produced about 15 pounds of honey for profit, besides 25 pounds left for their wants.

In connection herewith I would also state that the nectar here is in great quantity on account of the abundant morning dews.

Very respectfully,

FATHER METHODIUS,
Priest of the Greco-Russian Church, Sitka, Alaska

Hon. John G. Brady,
Governor of Alaska, Sitka, Alaska

A Russian priest in Sitka with some bee hives; this is most likely Father Methodius, Alaska's first beekeeper, with his six hives in the fall of 1900. Photo courtesy of Alaska State Library - Historical Collections, Sheldon Jackson College, Merrill Photograph Collection, SJC 29-861[1].

Father Methodius is not clear in his terminology, especially in his use of the term "swarm". Perhaps a bit of apicultural speculation is in order here. Contemporary beekeepers may say that his colonies swarmed, he retrieved them and thus made his increases. I think Father Methodius is using the term "*swarm*" for "*a colony of bees*" or in later references a "*split*". Note on May 31st he received his initial shipment of two hives with two "*swarms*" of bees (italics mine); he then reports that on June 20th "*the bees increased to two more swarms"*, and on June 28th "*two more swarms were added with a satisfactory result*". If we examine the evidence in an article (quoted below) from the newspaper *Sitka Alaskan* dated September 15, 1900, it is more likely that he made what we would call splits. He paints a pretty rosy picture of the apicultural potential until he mentions the rain – according to both Kashevaroff (MS 149-4-3, 1927) and Georgeson (1906) Father Methodius was unsuccessful in his attempts at beekeeping.

Here is the full text from the September 15, 1900 issue of the *Sitka Alaskan* (De Armond 2009a):

APICULTURE

A Practical Demonstration of that Industry at Sitka.

Another industry has been proven to be possible and profitable in Sitka by Father Methodius of the Sitka Russian Mission.

Father Methodius whose previous residence was St. Petersburg, has, during his leisure moments, made a study of bee culture, and had quite an extensive apiary at his suburban home there. After a careful study of the environments at Sitka he became convinced that bee culture could be made a pleasing and profitable odd moment occupation.

By an expenditure of $25 he imported two hives of bees from Seattle the latter part of May. On June 20 he divided these swarms and instead of two, had four armies at work among the daisies and clover blossoms. October 15 he again broke into the arrangements of his laborers households and added two more hives to his apiary.

He now has six hives of the busy little insects and is confident that they will all be able to supply themselves with a winter's stock of food after he has taken about 40 pounds of honey from each of the two original swarms.

At St. Petersburg Father Methodius started with seven swarms and in four years had increased his stock to 150 swarms, without the importation of a single bee. Besides thus increasing his hives he had an income of a thousand dollars a year from the sale of honey and wax.

This opens to the door to an industry whose field is as broad as are the mountains and valleys of Alaska, and a great feature of this industry is that it requires no great expenditure of either money, brains or physical strength, but only a watchful attention.

From a "modern" management perspective (albeit not knowing the strength of the original 2 colonies) making four splits from two colonies in less than one month, then expecting good queen mating in an area where Father Methodius himself wrote, "as the bees worked not more than 15 days from June 1 to September 1," would seem to me not the best management technique. As there is no mention of any queens being imported we'd have to assume the splits were left to raise their own queens. However, please remember this is apicultural speculation on the part of this author.

The next documented source I could find was in the Annual Report of the Agricultural Research Station in Sitka (Georgeson 1906). Georgeson mentions that the Experimental Station brought two stands of bees to Sitka in June of 1905 supplied through the Bureau of Entomology from a beekeeper in southern Washington State. In his report C.C. Georgeson also describes a Russian priest importing bees prior to 1905 (undoubtedly Father Methodius), but they failed to thrive. This earlier attempt is substantiated by correspondence between a Professor Essig (University of California, Department of Entomology) and A.P. Kashevaroff of the Territory of Alaska Library and Museum in 1927. Kashevaroff's reply to Essig's query about bees in Alaska states that a missionary named Father Methodius attempted to keep bees in Sitka in 1900 but without success (MS 149-4-3, 1927). Kashevaroff also discounts rumors that bees were brought to Alaska in the early 1800's (Ibid). Essig reports on his correspondence with Kashevaroff discounting earlier Russian introductions in his classic work, "*A History of Entomology*" (Essig 1931).

S.S. West, a Fairbanks beekeeper in the late 1940's, writing in a University of Alaska publication (West 1947) mentions "*In 1900, Father Methodius of the Sitka Russian Church, who had formerly had an apiary of 150 colonies in St. Petersburg, imported two colonies of bees from Seattle at a cost of $25.00. The bees arrived near the end of May, and on June 20 he divided both colonies to obtain a total of four. On October 15, he divided again, so that he wintered six colonies. Apparently all died during their first winter or shortly thereafter.*" West does not give his sources, but his article does not tally exactly with Father Methodius' official report.

Frank Pellett's book, *American Honey Plants* (Pellett 1920) is often cited in articles both in print and on the Internet giving 1809 as the first introduction of honey bees to Alaska. He does not give his sources, but it appears that it was based on earlier reports by Parks (1917). Unfortunately this date (1809) cannot be substantiated; let's look at Pellett's full quote -

"*By the accounts given in Bancroft's History of Alaska and in translations made for me by Rev. George Kostrometinoff (DeArmond 2009b) from the records of the Orthodox Russo-Greek Church at Sitka, the honeybee was first introduced into Alaska in 1809 by a monk named Cherepenin. These bees came from the Department of Kazan, in Siberia, and were brought that honey might be added to the scanty food supply of the pioneer teachers of the Faith as well as to supply the candles for the church services…. As early as 1819 apiculture was taught in the church school and was continued up to 1894. It would appear that the bees never flourished and seldom swarmed. There are a number of records of new importations to take the place of dead colonies. Very early a white clover was introduced to help out the honey supply. About 1830 bees were taken from Sitka to Fort Ross in California. As late as 1905 there were about 30 colonies at the Russian school at Sitka. These bees were in straw skeps and were kept on shelves under the eaves of the house. In winter they were kept within the same projecting eaves. In 1906 the Experiment Farm at Sitka made an unsuccessful attempt to keep bees in Langstroth hives. It is not probable that beekeeping will ever be a commercial project in Alaska. References to beekeeping at Sitka by Dr Sheldon Jackson are to be found in the Report on Education in Alaska, Bureau of Education. Prof C. C. Georgeson, in the reports on work done at the Experiment Station in Alaska also mentions beekeeping. Bees were observed collecting nectar and pollen from plants given below during the years 1905 to 1912….*" (Pellett 1920).

Problems with Pellett

Although Pellett (1920) sounds very convincing with his date of an 1809 importation, I was unable to verify any of his sources. I have read H.H. Bancroft's *History of Alaska* (Bancroft 1886) several times expressly looking for bees or beekeeping references – not even the word honey shows up.

I was unable to verify Pellett's claim that "*As early as 1819 apiculture was taught in the church school and was continued up to 1894*" but, during the restoration of the Bishop's House by the National Park Service (a project begun in 1973 and lasting for 16 years), a book (in Russian) "*Lectures on the benefits of Raising Honeybees*" published in 1902 in St. Petersburg was discovered (Thorsen 2009) and has been on display at the museum. The Russian Bishop's House in Sitka is one of four remaining Russian built structures left in North America; others include - one at Fort Ross California, another building in Sitka, and a decrepit building in Kodiak, Alaska.

Much of Pellett's information appears to be gleaned from an earlier account by H.B. Parks writing in the *American Bee Journal* in June of 1917 (Parks 1917; also cited in Watkins 1968a). The account by Parks describes how "*a double walled skep and its horde of toilers*" were brought from Kazan and "*today in Sitka and other old Russian towns in Alaska are the sturdy descendants of this hive*." Further on in the article he makes the claim that, "*…Fort Ross was established by the Russians about 200 miles*

north of San Francisco. Here bees were brought from Sitka, so that in California today may be found the descendants of bees from Russia, Mexico, and Spain, together with modern importations" (Parks 1917).

H.B. Parks was the instructor and superintendent of mechanical work at the Sheldon Jackson Indian School in Sitka from mid 1907-1911, contemporaneous with C. C. Georgeson of the USDA Agriculture Experimental Station. Parks, who was very interested in beekeeping, later (1918) became the apiarist for the division of entomology, Texas Agricultural Experimental Station in College Station and in 1923 moved to San Antonio to establish the nearby Apicultural Laboratory. He spent the rest of his life in Texas involved with beekeeping and research projects. There is no doubt he was not just a layman writing about bees, but he is also no stranger to "historical controversy". I found a biographical sketch of Parks on the Internet where he is credited for having "discovered" a popular folk song "*Follow the Drinking Gourd*". In a discussion of the historical roots of the song and Parks' credulity, researcher Joel Bresler mentions "*A clever fabrication?*" and "*he wouldn't be the first folklorist of the late 19th and early 20th century to embellish an account*" (Bresler 2008). Parks gives no references for his information in his 1917 *American Bee Journal* article "*Some Bee History*", allowing no further investigation.

Lee Watkins, writing in the April 1968 *American Bee Journal*, takes Pellett and Parks both to task in an article "*The Myth of Russian Bees in California*" (Watkins 1968a). We must also consider the historical setting of Russian America (as Alaska was called at the time), New Archangel (present day Sitka), the time and travel distances, the rigors of colonial life, and the climate; none of these factors are conducive to beekeeping.

Russian America was "discovered" (it was there all along – Asiatic peoples had migrated across from Asia thousands of years before) by a Dane, Vitus Bering, under the employ of the Russian Czar and a Russian, Aleksei Chirikov (captains of separate ships) in 1741. The present city of Sitka was established in 1799 by Alexander Andreevitch Barnof (also spelled Barnov), then Chief Manager of the Russian America Company (RAC). Barnof arrived under the auspices of the Russian-American Company, a "semi-official" colonial trading company chartered by the Tsar. In 1802 a group of Tlingit (the local indigenous people) destroyed the original establishment known as Redoubt Saint Michael (an area today called the "Old Sitka") and killed most of the Russian inhabitants. Barnof returned to Sitka in 1804 with a large contingent of Russians and Aleuts aboard three small but armed RAC vessels and the Russian warship *Neva* commanded by a Lieutenant Lisianski, who was diverted from a Russian round-the-world expedition. The ships bombarding the Tlingit fort were not able to cause significant damage to the earth works, but shells lobed over the walls caused loss of life. The Russians then launched an attack on the fort and were repelled by Tlingit fighters and marksmen—Baranof was slightly wounded. However, the Tlingit gunpowder reserves had been lost before the Russian assault and the Tlingit were forced to leave the fort. Following their victory at the Battle of Sitka the Russians established a permanent settlement in the form of a fort, named Novoarkhangelsk (New Archangel).

There was significant animosity between the locals and the colonialists—the Russians spent lots of time huddled in their stockade, food was short (starvation was common) and supply ships seldom visited. It was also a long way home to Mother Russia - two Naval Lieutenants on an "express mission" from St. Petersburg to Okhost (a port on East coast of Russia) spent from April to August of 1802 just crossing Siberia (Davidoff 1810).

Sitka is also notorious for its precipitation – an average of 87 inches of rain and 40 inches of snow per year are recorded over the last 30 years. The temperatures are mild, with an average of 55ºF in July and just 34ºF in January; not a climate conducive to beekeeping as the average July temperature is right near the threshold for bee foraging flights.

C.C. Georgeson, after failing in his attempts to keep bees in Sitka, wrote in his 1906 USDA Agriculture Experimental Station Report "*Beekeeping cannot be made a success in Southeast Alaska*" (Georgeson 1906).

I find it difficult to believe that bees in skeps could have been transported from Kazan (west of the Ural Mountains in central European Russia) to the east coast of Russia, a distance of more than 6000 kms (3600 miles) in the early 1800's. Eva Crane reports that bees were first brought to the Khabarovsk (Primorye) region in 1887 (Crane 1999) and Dorothy Galton mentions bees in the early 1800's being introduced to Tomsk in SW Siberia - still thousands of miles from Russia's Pacific Coast (Galton 1971). It does not seem logical that the Russians would bypass the rich bee pastures of the Primorye region in favor of rainy Sitka. The Trans-Siberian Railroad was not completed until 1913.

I could not corroborate Pellett's claim that "*References to beekeeping at Sitka by Dr. Sheldon Jackson are to be found in the Report on Education in Alaska, Bureau of Education"* after searching archives in Sitka and historical collections at the University of Alaska, Fairbanks. As H.B. Parks was Assistant Superintendent of the Sitka Training School from 1905 to 1911, concurrent with the residency of C. C. Georgeson at the Ag Research Station, and Sheldon Jackson left Alaska in 1907 (he died in1909); the three of them must have crossed paths in a small town like Sitka. It is strange that Georgeson, after his attempts at apiculture, would not have mentioned other bees kept in Sitka - "(*As late as 1905 there were about 30 colonies at the Russian school at Sitka. These bees were in straw skeps and were kept on shelves under the eaves of the house. In winter they were kept within the same projecting eaves*)" (Pellett 1920); or Parks would have not given better references. In addition to the accompanying photo of Father Methodius with his bees in back of the Russian Bishop's House, I have seen other photographs and never seen "*projecting eaves*".

The claim by Parks and Pellett that honey bees were brought by the Russians to California in 1830 has been historically debunked (Watkins 1968a) and from a practical standpoint does not seem likely. The coastal zone shelf where the Russian settlement of Fort Ross was established is currently described as "not suitable for honeybees", however a species of bumblebee (*Bombus vosnesenskii*) thrives in the area (*Fort Ross* 1998); named after Russian naturalist I. G. Vosnesenskii who, as a naturalist and curator of the Zoological Museum of Natural Sciences in St. Petersburg, was sent to collect insects (Essig 1991).

Alexander Barnoff gave orders to Ivan Alexsandrovich Kuskoff (commander at Fort Ross from 1812-1821) in 1813 instructing, "*…it is also necessary to investigate whether in the peninsula of the lesser Bodega, in the valleys and in the fields there are not those beneficial insects i.e. bees, which produce honey and wax essential to the prosperity and social life of mankind*" (MS 149-4-7, 1927). It seems as though the Russians were *hoping* there might be honey bees in the area – but none of the entomological researchers/collectors mention them.

Other Russian authors, acting as agents for the Russian America Company (RAC), e.g. Ivan A. Kuskoff and Kiril Khlebnikov, give *extremely detailed* lists and records of RAC activities. Along with requests for three nautical calendars and four-dozen pencils I was able to find on the list of necessities for 1820 "*25 pud of honey for pharmacies and officials and 610 pud of sugar*" (1 pud = 36.11 pounds, so about 900 lbs of honey and a metric ton of sugar); these were supplies brought *from* Russia *to* New Archangel - Sitka (Khlebnikov 1994).

Khlebnikov, who even by today's standards could be considered a globe trotter, made several trips back and forth across Siberia spending an average of seven months each way in transit. He recounts a sea voyage departing Kronstad (near Leningrad on the Gulf of Finland) on September 7, 1816 and arriving in Sitka November 20, 1817 via Cape Horn (Khlebnikov 1990). A one-way voyage from Sitka to Fort Ross averaged one month. To transport "*a double walled skep and it's horde of toilers*" for seven months across Siberia (winter or summer) or transport them by sea for more than 15 months strains the imagination; they weren't even on the manifest!

Bees to Alaska's Interior- 1913

It's a chore researching microfiche records – you're dizzy from the microfiche

strip flying by and it's easy to get distracted by war stories as reported nearly 100 years ago. I wouldn't have had the patience, so I fudged a bit and asked local agricultural historian Jo Papp about her sources for the first bees in Fairbanks (Papp & Phillips 2007). A few days later I was hunched over the microfiche reader at the UAF Rasmussen Library reading a short paragraph in the August 27, 1913 *Fairbanks Daily News Miner*.

"***Vining Brings in Two Hives of Bees*** - *As part of the cargo brought to Fairbanks by the steamer Alaska which arrived in port last night, were two hives of bees. The little honey gathers were brought North by R.L. Vining, being the first ever brought into the Interior. They are for Mrs. Ed Wickersham and Mrs. Truxton*" (1913 *News-Miner*).

One would have to speculate that the bees (I'm going to assume they were some sort of nuc or even a full hive) would have had a tough time arriving in August which is the end of our honey season after a long voyage. Their route is open to speculation - the news item …"*brought to Fairbanks by the steamer Alaska which arrived in port last night*" leads me to conclude they were landed right here in Fairbanks; *but* the "*steamer Alaska*" was an ocean-going vessel and could never make it up the Yukon-Tanana-Chena River route to Fairbanks. They would have most probably been transferred from an ocean going vessel at St. Michaels (at the mouth of the Yukon River) and then come by paddle-wheeled riverboat from there; a voyage of perhaps six to eight weeks from Seattle to Fairbanks. The most probable answer, according to local historian Dermot Cole, is that they arrived by a riverboat also named the "*Alaska*" (Cole 2009).

Two years later (August 4, 1915) another bee item appears in the *News Miner* that demonstrates even then reporters got things wrong! Here it is in full-

BUSY BEES ARE THRIVING HERE

Twenty-four Pounds of Honey are Taken from One Hive of Bees

THEY WON'T SWARM

Movement Is Now On Foot to Ship Queen Bees from Outside

That the raising of bees and the production of honey may one day be a thriving industry of the North has now been fully demonstrated as it is now an assured fact that the little sweet manufacturing insects will withstand the rigors of this climate with a little bit of care. There is only one hive of bees here at the present time, but they have demonstrated their ability to make enough honey to live on with some to spare.

This hive of bees is down at the Arctic Greenhouse. Twenty-four pounds of honey were taken from the hive yesterday and are now on sale at a local grocery store at $1 per pound.

These bees were shipped into the country two years ago by Mrs. L. Truxton and Mrs. Ed Wickersham. Those owned by Mrs. Wickersham failed to live through the winter, but Mrs. Truxton's hive lived very nicely off the flowers in her greenhouse.

When Ms. Truxton went Outside last summer she sold her bees to Charles Blaser of the Arctic Green house. He made a place for them at one end of his hot house and fixed the hive so that they could go into the hot house or out into the open air Mr Blaser did not attempt to take any honey from them, stating he did not know how to handle them.

Mr. Blaser's successor at the greenhouse, Peter Mortenson, is well versed in the science of handling bees. Accordingly, he made preparation to extract the honey from the hive and the operation was performed yesterday with success.

While he was extracting the honey yesterday Mr. Mortenson made a mental note of the fact that there are a large number of young bees in the hive. They have never swarmed which fact is believed to be due to the shortness of the summer season.

*Since it has been demonstrated that the bees will not swarm in this climate, it has been suggested that some of the "honey" enthusiasts send Outside for queen bees as it is believed that if a queen bee could be introduced into the hive, she would soon be able to gather a crowd of followers together By careful handling she and her followers could then be transferred to another hive and so the propogation (*sic*) of the bees would continue.*

As you may realize, the reporter just didn't quite grasp the concept of making a split. As for swarms- we should be so lucky! Our package bees seem to break the rule by building up fast enough so that, if proper space (at least two deep brood chambers) is not maintained, they will swarm 6-8 weeks after hiving.

The honey harvest and prices paid were of interest to me; twenty-four pounds would be a less-than-average year by current standards here in Fairbanks (50-60 is the norm). How to relate the $1 per pound price to today's value of the dollar? The price of gold was $20 an ounce – now it's over $1000; using that as a gauge then we should be getting 1/20th the price of gold for a pound of our honey; but even in Alaska people would balk at $50/pound! To refine the price I took a look at some of the ads on the same page of the newspaper article. Prospectors and miners were urged to "*Get their waterproof wall tents, weight ten pounds, get one now before they are all sold. You might want it to go stampeding* (the old term for folks going out prospecting) *or on your hunting trip*." The price was $6.50. Or, you could drop by the Shaw House Grill for breakfast (50 cents), lunch (75 cents), or dinner ($1.00) with your dance hall gal after you've bought her a dozen roses for $6.00. Nowadays a gold miner breakfast runs about $7-$9 and a meat & potatoes dinner at least $25. Being either a beekeeper or a gold miner in Fairbanks is a big gamble. I am further impressed by the fact that both the hives shipped to Fairbanks originally went to women.

A short item in the Editorial section of *Gleanings in Bee Culture* sent into the magazine by a Mr. A. T. Cook mentions an article in the *New York World* of October 20, 1913 confirming the shipment of two colonies to the Fairbanks ladies – it also mentions there were two Alaskan subscribers to *Gleanings in Bee Culture* regularly receiving copies (Root 1914).

To be continued next month (1920's to present day).

Acknowledgements

I am indebted primarily to Jo Papp whose notation of early beekeeping in Fairbanks (Papp 2007) inspired me to collect my notes that had accumulated for over 20 years and write; to the staff at the various Alaskan Historical Archives locations, to my nephew, Micah Todd, who personally accessed the Hewitt Apicultural Collection at Yukon College in Connecticut to make some copies for me, and especially to Hal Livingston, a beekeeper of some 50 years experience here in

A map of Alaska showing documented locations of honey bee introductions (see text this month and next)

Fairbanks for great stories, access to past issues of bee journals and for sharing some of his personal archives. Thanks to Ashley Kircher of the Sitka Historical Museum for her efforts in tracking down historical photographs; Deirdre Helfferich of the School of Natural Resources and Sciences for the photo of John Bohme; Rosemary Carleton of the Sheldon Jackson Museum for information on Rev. Sheldon Jackson; William DeArmond of Sitka for accessing and transcribing a bee news item from the *Sitka Alaskan* and comments on my manuscript; and to the very helpful Sandy Johnston and the staff at the Alaska State Library Historical Collections department.

Photo Credits (Part 1 of 2)

(1) "*Russian Priest with beehives at Sitka*", Photo courtesy of Alaska State Library-Historical Collections, Sheldon Jackson College, Merrill Photograph Collection, SJC 29-861

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HONEY PRODUCTION IN GUINEA

Part II – Bee Product Production, Processing and Marketing in Guinea

by CONRAD BÉRUBÉ

The author's trip to the area is indicated by the red circle.

Honey production is a secondary activity for the subsistence farmers of Guinea. The Kenya Top-bar Hive (KTBH) would allow rural beekeepers to increase the quality and quantity of bee products significantly—without expecting a revolutionary increase in apicultural acumen or capital acquisition. Assuming that:

- annual per capita income in Guinea is about $2,000[2]
- given the small size of the typical Guinean traditional (fixed comb) hive, per hive yields are probably about 3 to 4 kg per year)[3]
- average number of hives in the Futa Djallon region are about 10 (ballpark estimate from field work in Guinea)
- bottled honey sells for about $1.5 to $2.5 per liter ($1.10 to $1.80 1.4 kg) in Guinea or an average of $1.42 per kilo

Therefore:

- The annual income (from 10 traditional hives per honey producer x 3.5 kg/hive/year x $1.42 per kilo) is currently approximately $50 per year per beekeeper.
- KTBH yields are typically 20 to 40 kg per year (almost ten times as productive as the figures assumed above)— but let's call the KTBH five times as profitable (just to be on the safe side, since KTBH's are more costly to build than traditional hives). Therefore honey producers should be able to easily increase their income (with 10 KTBH's) to $250 per year.
- KTBH's offer a means to significantly increase the annual income from hive products. That's over 10% of the per capita income (and I would imagine that rural farmer incomes are considerably less than the $2000 national average)—but it also assumes that the honey producers could find buyers for their wares—which may not al-

Demonstrations of the production of moisturizing cream were so popular participants queued up to take samples home to the rest of the family. Here in Bousura even a youngster seems to enjoy sampling the fresh pomade. The folks in the village of Gouba were so enthused about the stuff that the senior wife of a village elder gave her husband an impromptu masssage with the skin treatment.

During my stay I lead staff and beekeepers through demonstrations of the production of : •candle-making •batik dyeing •moisturizing skin cream •soap

ways be the case—particularly given the very competitive nature of honey markets. Also, given that production is closely linked with the vagaries of weather and the local resources available for processing and packaging, it will be tough going to ensure that beekeeping production is of a quality and quantity to remain sustainable.

Soap is a value-added product that can be worked up from beeswax and honey. Engaged in such an undertaking are the rural development staff of FAPI, from left to right Rahilou Fatamatou Diallo, Abdourahmane Diallo, Abdoul Gadiry Diallo, Tanou Diallo, Alpha Oumar Diallo, Barry Harouna, and Mamadou Oury Sow.

At right, Tanou Diallo and Abdourhamane Diallo transfer their newly learned skill at making cold cream utilizing locally produced beeswax and shea butter to other staff of FAPI.

Hot drying winds and working in soil can deplete protective skin oils. There is much potential in Guinea for the cottage-industry production of moisturizing skin cream. These value-added products made from local beeswax and shea butter can significantly increase a subsistence farming family's income. Tanou Diallo and Abdourhamane Diallo along with local soap-maker Asiatu Jing of Gouba demonstrate how beeswax and honey produced in the community of Hore Kola can be cooked up with other materials to form a cosmetic moisturizer and soap. Care must be taken in this process as it includes the use of caustic soda or lye which can cause chemical burns.

Mamadou Bailou Kaby, president of a beekeeping cooperative in the village of Bousura, demonstrates to colleagues his newly learned skills at making candles and moisturizing skin cream using beeswax.

In between field visits I worked with staff to add to their repertoire of training skills. We practiced a simple technique for tracing newsprint posters to use as visual aids to encourage discussion and assist instruction during village presentations. Similarly, we practiced using photos from magazines and other sources as teaching aids. Staff participated in simple but effective means of processing honey and beeswax for market. The use of role playing and folktales as non-formal education techniques was explored. We practiced making a variety of value-added products that incorporate honey and/or beeswax such as soap, batiked cloth, moisturizing skin cream and candles using local materials and innovations suggested by the staff and local craftspeople. We also encouraged networking with staff working in other programs and across disciplines as an aspect of the integrated development philosophy practiced by OIC and FAPI.

I'm not sure if oil lamps were developed preferentially over candle-making in Africa but, for whatever reason, it does not seem to be generally well known in the rural areas where we worked that beeswax can be used to make high-quality candles. This, even though folks often spend a significant amount of their earnings, in the many areas without electricity, on paraffin candles. Making free-standing candles, especially if they are tapered or cylindrical, usually requires an expensive mold or hours of tedious dipping. A few years ago I developed a technique using PVC tubing and condoms as an appropriate technology alternative to pricey latex molds (a latex mold that produces a single tapered candle can cost $60 Canadian!) The combination is necessary because wax will leak out of cut PVC tubing and an unenclosed condom will inflate to form a huge candle which would have to be priced too high for local markets to support. This exercise naturally leads to discussion of family planning and AIDS prevention. Representatives from public health units involved in AIDS education programs in Guinea expressed interest in using the activity as an ice-breaking exercise to reduce inhibitions around such discussions and the handling of condoms). You can google "condom candles" to find complete instructions. One of the FAPI technicians, Abdourhamane Diallo, came up with another great idea for making high quality candles using the petioles from papaya leaves, readily available in most of Guinea. In contrast to PVC tubing, the petioles can be easily split prior to placing the wick and filling with wax. The tight seam formed when the cane-like petiole is split and tied back together permits little wax to escape and the candle can be easily removed, eliminating that need for an additional liner.

Processing and packaging of bulk honey presents further challenges towards which FAPI is working towards solutions. Mamadou Yaya Diallo indicated the federation had difficulty in obtaining tanks for storage

of honey. Fifty-five-gallon drums used for the transport of oil are recycled to this end but must undergo rigorous cleaning and, if not properly treated, the acids in the honey will corrode the metal and the honey will take on an off-flavor. Aluminum paint, which is used to treat the tanks to prevent this, is difficult to obtain and very expensive. Federation members have experimented with lining the tanks with plastic bags. I suggested that coating the inside of tanks with wax, as is sometimes done in Canada, might be worth trying and the technicians seemed receptive and committed to testing the idea.

In addition to the production, processing and packaging problems that are shared in common by beekeepers throughout the world, the beekeepers in Guinea experienced a few problems that are unique to the African context. Quite surprisingly beekeepers in the Gharki region mentioned that bears are a frequent problem in the area and often destroy hives—however, subsequent inquiry determined that, although they used the French word "*ourse*" to describe the animal, they were actually talking about the honey badger—a member of the family of mammals that includes weasels, skunks, otters, and, of course, badgers. The honey badger is a wolverine-like creature which seems to share that creature's reputation for fearlessness and the bear's appetite for honey and bee brood. In addition, in nearby Balaya, the villagers mentioned that monkeys ravaged many of their hives. Tying the lids to the hives had proved unsuccessful in deterring the raids because the animals would chew through or untie the vines used to secure the hives. We suggested tying the hive lids down with ropes impregnated with used motor oil combined with powdered chilli pepper (using equal parts grease and chilli pepper powder) might be effective. String fences of this type have been used in other areas to prevent elephants from raiding crops[4].

Although not unique to Africa, Guinea's status as a developing country makes market issues more challenging. In the villages and towns of Guinea, honey is considered a luxury good. To producers honey serves as a cash crop which can provide income for market goods, but which is rarely the principal source of livelihood. This creates some rather unusual market dynamics. The honey producers feel, justifiably so, that the relative scarcity of the commodity which they purvey should command a price commensurate with its relative rarity. The difficulty is that local customers do not have the abundance of cash to pay premium prices. As a further impediment, in many West African countries honey is fermented into a mead-like honey beer—however, Guinea is predominantly Islamic (approximately 85% are Muslim, 8% are Christian, and 7% adhere to indigenous belief systems). Devout Muslims abstain from alcoholic beverages and are even prohibited from selling their produce for the

FAPI staff proudly show off the result of their efforts to develop an appropriate technology candle-making method in which they innovated the use of papaya leaf petioles as molds.

PVC tubing and condoms can be used as an appropriate technology alternative to pricey latex molds (a latex mold that produces a single tapered candle can cost $60 Canadian!) The combination is necessary because wax will leak out of cut PVC tubing and an unencased condom will inflate to form a huge candle which would have to be priced too high for local markets to support.

This exercise naturally leads to discussion of family planning and AIDS prevention. Representatives from public health units involved in AIDS education programs in Guinea expressed interest in using the activity as an ice-breaking exercise to reduce inhibitions around such discussions and the handling of condoms.

You can google "condom candles" to find complete instructions. One of the FAPI technicians, Abdourahmane Diallo, came up with another great idea for making high quality candles using the petioles from papaya leaves, readily available in most of Guinea. Whereas as the petioles can be easily split to remove candles in contrast to the PVC tubing no additional liner is needed to prevent leaking.

Guinean beekeepers seemed enthusiastic and even surprised about the results of a simple demonstration making beeswax candles. Perhaps oil lamps were developed preferentially over candle-making in Africa but, for whatever reason, it does not seem to be generally well known in the rural areas where we worked that beeswax can be used to make high-quality candles. This, even though folks often spend a significant amount of their earnings in the many areas without electricity on paraffin candles.

The usual method of selling honey in the open markets typical of rural Guinea involved doling out the amount requested by the customer into a receptacle of the buyer's own.

Promotional posters for "FAMiel" a proposed "flagship" brand of honey. All component honey to be blended into this proposed premium label product should conform to the following specifications:

- **have a moisture content no greater than 19%**
- **contain no significant particulate matter**
- **contain no "off" flavors**

local markets. At the same time, global communications make information about international commodity prices widely available. The high prices paid for products such as beeswax and honey in European and North American markets can be very tempting to producers who are selling their wares locally for tiny fractions of what they see are being paid overseas. Unfortunately, the producers are usually not aware of the huge expenses incumbent in meeting quality standards and in shipping commodities overseas. In addition, honey produced in Guinea often carries the taint of excessive smoke used in harvesting and (as in other parts of the tropics) is naturally very dark and strong flavored. Such strong-flavored honeys are often downgraded in Western markets where customers are accustomed to the much lighter and milder-flavored honeys typical of temperate zone floral sources.

Here's an analogy: imagine that you are trying to sell a Ferrari sports car to a neighbor who would very much like to own it, particularly because it is painted in a color scheme that corresponds to the colors of your local sports team— you both agree that the price is set fairly at $50,000—your neighbor just doesn't happen to have that kind of cash lying around. You could lower your price considerably to fit within your neighbor's means or you could try to sell your car in the big city where there are folks willing to pay the higher price, but where there are also other folks selling Ferraris— some of whom already own showroom dealerships and who have established reputations with Ferrari purchasers—and where the color scheme of the car is a detriment because it doesn't correspond to the paint jobs preferred in the larger market. This is more or less the situation of the Guinean honey producer; he can either sell his wares locally at a less-than-optimal price or he can enter a larger, more competitive international market requiring a great degree of effort, investment and business acumen in order to have any chance of success. In addition, the exigencies of meeting even regional, let alone international market logistics, can be very challenging in the Guinean context. There are few paved roads off the routes between major population centers and the packed dirt secondary thoroughfares can become nearly impassable quagmires after a rain, which can be fairly bumpy at the best of times. To illustrate, I tried to keep up my exercise regime with a daily jog during my stay in Guinea and on more than one occasion I was able to pass loaded freight trucks as they crawled precariously around potholes and rock-filled patches. On another occasion, while riding tandem on a motorbike, I had to jump off the back of the cycle on an uphill stretch to avoid a spill as we were moving so slowly up the rocky incline that we could not manage sufficient forward momentum to maintain our balance. I believe that these kinds of practical hurdles are often overlooked in economic analyses based largely on cost/benefit ratios and the like. Nonetheless, I provided regulations for export of hive products to the European Union to both FAPI and OIC to allow them the opportunity to explore such options.

Businesses throughout the world face the hazard of trying to get too big too fast and this is particularly true in the developing world. Therefore, to my admittedly limited perceptions, it seems to me that it would probably prove more fruitful, at least in the short term, for the honey producers in Guinea to concentrate on developing local and regional markets, building customer bases both in their immediate environs and in the major population centers in the region: the country's capital, Conakry, and Dakar, Senegal— the major trading hub for francophone West African countries. Although the relatively small upper class has access to satellite TV, most advertising in rural Guinea is conducted by billboard, radio and newspaper. I suggested that FAPI might attempt a marketing campaign beginning with billboards for which I put together several mock-ups in lay-outs consistent with local aesthetics. I encouraged FAPI to create a premium label honey that should have a moisture content no greater than 19%, contain no significant particulate matter and have no "off" flavors. I even proposed a name for the brand "FAMiel" as an off-shoot of *Fédération des Apiculteurs* (Federation of Beekeepers) and *miel* (honey) which suggested a ready slogan "*FAMiel pour la famille*" that is "FAMiel for the family". I also produced some examples of very simple labels that could be produced at the village level by woodblock printing, or even batik dyeing, as a means of upgrading product presentation.

A mishap during my return home al-

I suggested that FAPI staff look into the cost of reproducing labels locally using technologies for manual reproduction. Fairly detailed images and printing can be reproduced by using a linoleum or wood blocks for printing and it is often surprising how much significant natural talent for such artwork exists in villages. It may even be worthwhile to experiment with batiked fabric labels that could be made from recycled cotton using a linoleum or wood block stamp to transfer wax onto the fabric. Nonetheless, I also put together some label mock-ups for possible use with premium products for urban or international markets.

lowed me to contribute a final experience relevant to marketing—specifically, one that illustrated the difficulties in coordinating transport of market goods from Guinea. During my last few days in the country I took advantage of the fine handicraft markets in the country to make all my Christmas purchases. I arrived a week before the yule. My bags, however, apparently had other plans for the holiday—they didn't arrive until New Years Eve.

If you would like to read more about the Farmer-to-Farmer program or traditional beekeeping in West Africa and the Kenya Top Bar Hive see **http://www3.telus.net/conrad/oic_toc.htm** or google "bees for babar" to find my webpages. There are even videos available outlining the work described here which you can find on **www.youtube.com** by searching there for "beekeeping in Guinea", "Conrad Berube", or "beekeeping with the Kenya Top Bar Hive".

Conrad Berube
890 Eberts Rd
Nanaimo BC V9S1P6
email: **uc779@freenet.victoria.bc.ca**
bees for babar society **http://www3.telus.net/conrad/htmghana/bees_for_babar.htm**

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George S. Ayers
Department of Entomology
MICHIGAN STATE UNIVERSITY
East Lansing, Michigan 48824-1115

Safflower

Safflower, false saffron, bastard saffron, Mexican saffron, carthamē des teinturiers, safran bâstard

Scientific name: *Carthamus tinctorius*

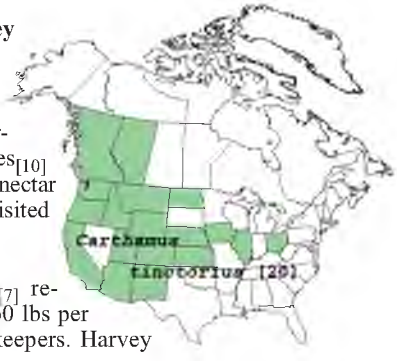
Origin: Probably Eurasia from the eastern Mediterranean to the Persian Gulf [11, 13 & 21]. The plant is known only from cultivation (a cultigen) [13 & 21].

Plant description: Safflower is a 2-6 foot high, glabrous[1], shiny green annual with a vertical stem that branches in its upper parts. The leaves are sessile[2], broadest beyond their midpoint, and have minutely spine-tipped teeth that make contact with the plant unpleasant. The involucre[3] is 0.79-1.6 inch (2-4 cm) in diameter. The 15 to 150 flower heads of a plant are generally yellow to orange in color (rarely white or red) and range in diameter from 0.5 to 1.5 inches (1.3-3.8 cm) and occur at the upper end of the central stem (main flowers), at the ends of the branches (primary flowers) as well as along the branches (secondary flowers). Corollas[4] of the individual florets are 0.78-1.18 inches (2-3 cm) long and terminate with five, pointed segments (corolla lobes) that together look a bit like a star. The highest flowers of the central stem open first with those on the branches opening progressively downward. Each flower head usually contains 20 to 100 florets where the outer florets open first, followed progressively by those in more inner positions. Flowering occurs over a period of 10-40 days with each flower head blooming for a period of 3 to 5 days. Nectar is secreted at the base of the stamen filaments. [8, 11, 13 & 15]

Distribution: Keil and Turner[11], writing about California plants, describe the plant's distribution outside of agricultural fields as disturbed places and roadsides primarily in the Great Central Valley and surrounding areas at elevations less than 1000m (3281 ft). When it escapes from cultivation, it occurs primarily as a waif[5] [13 & 21].

Safflower bloom. Notice the elongated corolla terminating in the five elongated pointed lobes. Also notice the prickly nature of the leaves. The white pointer points to the anther tube. The stigma can be seen just below the anther tube as a thin elongated yellowish structure. Photo taken in the W. J. Beal Botanical Garden on the Michigan State University campus in East Lansing, MI on 8/10/05.

Importance as a honey plant: Ayers and Harman[1], from their questionnaires, found the species to be of some importance in CA and AZ. Howes[10] states, the flowers "secrete nectar very freely and are much visited by bees."



Honey potential: Eckert[7] reports honey yields of 30-60 lbs per colony by California beekeepers. Harvey

[1] Glabrous: smooth, hairless
[2] Sessile: A sessile leaf is one without a stem (attached directly to the branch).
[3] Involucre: as used here, a set of bracts (leaf-like structures) that surround the base of a flower in the Asteraceae (see this column August 2005).
[4] Corolla: the petal portion of the flower.
[5] Waif: a nonnative species that does not persist for more than a few generations without human intervention.

Lovell[14] states that California beekeepers describe average per colony honey yields of 30 lbs. Boch[3] found the nectar sugar concentration to be 13-17% between 6.00 and 8.00 h, but became 24-29% the remainder of the day.

Pellett[16] provides the following quote from a personal letter from G. H. Vansell of the California Experiment Station at Davis, CA:

> "A plot of it (safflower) grown here at Davis by the agronomy division attracts a greater number of bees in comparison to any other plant available at the present time. It produces an abundance of both nectar and pollen. An individual floret in the compound head produces so much nectar that it fills up the tube and runs out onto the bases of the petals. At times there are as many as eight bees per square yard estimated to be visiting this plot, which simply hums with activity. The nectar is quite rich in sugar, exceeding by 10 to 15% samples taken from neighboring alfalfa fields."

Honey: There seems to be some disagreement concerning the quality of safflower honey. Harvey Lovell[14] describes the honey as "high grade", rather dark but with a good to excellent flavor. Eckert[7] reports that the honey is "rather dark and strongly flavored" and when grown in the vicinity of alfalfa, produces a mixture inferior to that of alfalfa. R. B. Wilson[22], in Eva Crane's book 'Honey a Comprehensive Survey', considers safflower honey from Arizona and California to be a one of the U. S.'s "miserable honey(s)". Elsewhere in the same book Crane states that safflower honey is "dark, strong (with an) unpleasant flavor and aroma" [5].

Pollen: Both the nectar and the pollen are highly attractive to bees[15]. Eckert[7] states that the pollen "appears to have an excellent brood-producing potential".

Additional information:

A Brief History

Safflower has been cultivated for many years and was being grown in Egypt at least as early as 2000 BC, but is a relative latecomer to mechanized arable cropping. The species was first cultivated for the production of two dyes, one yellow and one red. It was also recognized as having value as a potherb and for the production of oil used for cooking and medicinal purposes. It became an important oilseed plant in the US after World War II[21]. As an interesting aside to the dye story, one of the major uses of the red dye was to color cotton tapes that were used to tie legal documents together, and is suggested as the origin of the phrase "red tape"[23]. Both dyes have now largely been replaced by more stable synthetic dyes produced by the commercial dye industry. Today the species is primarily grown for its oil production. The yellow and reddish florets are sometimes dried separately to yield golden yellow and red powders that are used as a substitutes for the much more costly true saffron[6] to flavor and color a variety of foods ranging from fish and seafood to salads and pastries[23].

Safflower is commonly cultivated in the old world and to some extent in North America, primarily in California and Arizona, but has been successfully grown in every state west of the 100th meridian (a line from mid-ND to mid-TX) [15]. Since 1975 the world production of safflower has been declining, being replaced by other oilseed crops (soybean, sunflower and the canolas)[21]. The species is, however, tolerant to drought and high salinity soils. These characteristics may help safflower become a more attractive alternative in the future because these environmental conditions appear to becoming increasingly more common[21].

Bee Activity and Pollination Requirements for Seed Production

In a Canadian study by Boch[3], bees commenced foraging at 07.00 h, becoming most numerous between 09.00 and 11.00 h, during which time estimates of nectar and pollen availability indicated that on-hand nectar and pollen supply decreased rapidly leaving only current production levels of both, and after 12.00 h the bee population decreased rapidly. This bee foraging pattern seems to be fairly general and was also observed by other researchers[12 &17]. In the Boch study, while the bee populations decreased rapidly after 12.00 h, the nectar sugar concentration did not. Data collected by Levin and Butler[12] suggested that the greater bee populations in the morning were independent of the size of the bee population. They found this surprising since lower bee populations should leave higher amounts of nectar and pollen in the field in the afternoon than would larger bee populations. These two observations taken together seem to suggest that something besides nectar concentration is determining bee populations in the safflower fields. Boch[3] hypothesized that the phenomenon was due to an increase in relative attractiveness of the surrounding environment (more competing bee forage), while Levin and Butler conjectured that there was some unknown attractive component of safflower that diminished in the afternoon. Whatever the cause, the generalized foraging pattern suggests that damage from pesticide applications would be less in the late afternoon than in the morning[12].

Levin and Butler[12] noted that both honey bee and other potential pollinator populations were considerably greater on the edges of safflower fields than in the middle, suggesting that if bees are used for pollination, they should be distributed throughout the field rather than along the field's edge.

In the Levin and Butler study[12] cited above, there were more nectar-collectors than pollen collectors, and while this may be the general situation, I suspect the relative number of foragers collecting nectar versus pollen is usually determined largely by conditions back in the hives. Rubis et al.[17] investigated an interesting example where the relative number of nectar and pollen gatherers apparently was not determined by hive conditions. These researchers investigated differences between two lines of safflower, one that produced a normal thick-hulled seed and the other a mutant thin-hulled variety that released its pollen a few hours later than the normal line. They found that pollen collectors worked only the normal line, but nectar collectors worked both. A few bees with pollen were seen working the thin-hulled variety, but they were thought to be basically collecting nectar. This difference in pollen release is the basis for an interesting and somewhat unusual method of hybrid seed production discussed in greater detail under 'Hybrid seed production' below.

Safflower is generally considered to be a self-pollinated crop. Claassen[4], however, found that natural crossing of individual plants ranged from 0 to 100%. It is, therefore, not surprising that both McGregor[15] and Free[8] in their reviews of the literature, found evidence that the benefit of providing bees for pollination varied greatly. McGregor sites a two colony/acre recommendation made by Eckert in 1959[6] and then goes on to say that few beekeepers require payment for their pollination services of this crop because it is such a good nectar and pollen producer. He concludes, however, that only rarely are bees placed in safflower fields at densities as high as the Eckert recommendation, but that the grower would probably benefit more than the beekeeper by following the 2 colony/acre recommendation. Free concluded that bees would not greatly increase seed production in lines that are both self-fertile and self-pollinating, but where the line is missing either one of these attributes, bees would likely greatly benefit seed production. This is essentially what Eckert[7] in California and Rubis et al.[17] in Arizona found in their early safflower pollination studies.

Hybrid Seed Production

Historically hybrid safflower seed has been produced by an interesting method that pushes the pollination abilities of our bees to their limits. Initially the style and stigma are enclosed in a "tube" formed by 5 fused anthers that are attached to the corolla by short filaments (see accompanying diagram). Usually the style begins to elongate the morning the floret opens and pushes the stigma upward and out of the anther tube. If the anthers release their pollen before the stigma is pushed through the end of the anther tube, the stigma is coated with pollen as it emerges and self-fertilization can occur if the plant is self-fertile. If the pollen is released after the stigma emerges, there must be a transfer of pollen either from the anthers of the same flower or from another flower. Usually this is accomplished by some

[6] **Saffron: a deep orange food colorant and seasoning derived from the dried stigmas of the saffron crocus (*Crocus sativa*). Because of the hand labor involved in its production, it is among the most costly of spices and food colorants.**

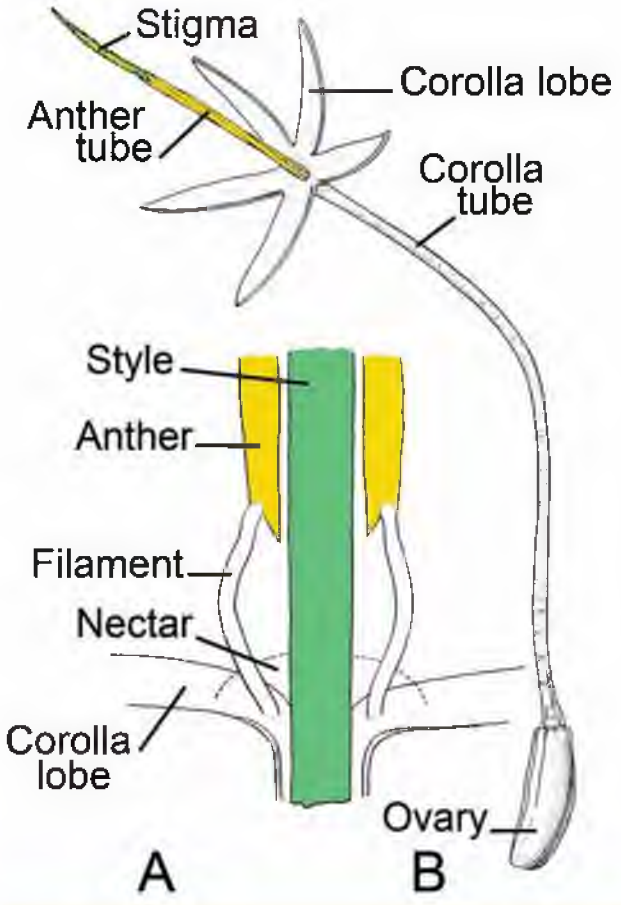


Diagram of *Carthamus tinctorius* flower illustrating self-pollination. '*A*' illustrates the style within the anther tube as well as the location of nectar secretion. '*B*' illustrates the entire floret. In this illustration the anthers have released their pollen before the stigma was pushed out of the anther tube as illustrated by the yellow coloration of the stigma representing pollen. Had the stigma been pushed out of the anther tube before the pollen was released there would be no pollen on the stigma, and in order for the floret to produce a seed there would have to be a transfer of pollen to the stigma by some agent of pollen transfer. Adapted from McGregor[15].

type of bee or more rarely by some other insect, as for example syrphid flies[7]. When the stigma emerges before the pollen is released, the flower is to some extent functionally male sterile ('female') even though it is technically self-fertile. It is this situation that provides the interesting approach to the production of hybrid safflower seed alluded to above. A recessive gene dubbed 'thin-hull' or '*th*' gene because it produces thin-hulled seed has been discovered that also provides this delayed pollen availability trait[8]. Once the pollen of the thin-hulled, 'female' plant has matured, its anthers become fragile and are easily ruptured by bees foraging for nectar. For the thin-hulled plant to produce pure hybrid seed, it needs to receive pollen from a compatible plant before nectar foraging bees rupture its anthers and transfer its own pollen to the stigma. This window of opportunity is not very long (see Table 1), and to accomplish this

Table 1. Time schedule of pollen availabilities and associated bee nectar and pollen collecting activities[18]

Normal variety pollen release (as the stigma is pushed out of the anther tube)	7.00-8.00 h
Thin-hulled variety pollen maturation and release	9.30-10.00 h (after the stigma has cleared the anther tube)
Nectar collecting on both varieties	Starts at 8.00 h; greatest: 9.00-14.00 h
Peak of pollen collecting activity on regular varieties*	8.00-10.00 h
* Pollen collectors generally do not work the thin-hulled varieties.	

pollination before the anthers are ruptured requires large numbers of foragers early in the morning.

As you might suspect, given the intricacies of this system, it doesn't work perfectly for hybrid seed production. Urie and Zimmer[19] found that pure hybrid seed produced in the greenhouse using hand pollination and pollen from the best variety of that time (Ute), outyielded that variety by 15 to 33% (average=24%). In the field, however, the crossing system described above does not normally provide pure hybrid seed, but also produces some of the thin-hulled, *thth* seed, which lessens this theoretical 24% figure (see associated figure). This problem isn't easily solved. In order to maintain the thin-hulled variety, which has the double dose of the *th* gene, there needs to be some self-fertility in that line, and as a result, some thin-hulled, nonhybrid seed is produced when the hybridization is carried out under normal field conditions. Remember, the window of opportunity for hybridization is not very long (Table 1). Apparently it was originally thought that the progeny of this thin-hulled contamination would be crowded out by the more vigorous hybrids, effectively making the outcome of the hybridization process pure hybrid seed. In the Urie and Zimmer study this didn't happen although the progeny derived purely from the 'female' plant were overgrown. Using five normal lines as males and two thin-

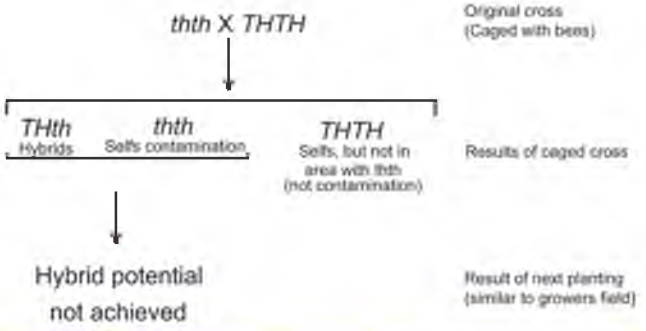


Diagram illustrating the Urie and Zimmer research[19] and the problem they encountered with the production of hybrid safflower seed using the delayed pollen release of the thin-hulled, *thth* variety. The diagram on the left represents the sequence of steps in the research; the text on the right describes the action or the result of the action.

[7] **Syrphid fly: These flies belong the family Syrphidae. They often resemble bees and are found associated with flowers much like the bees they resemble and are sometimes mentioned in the apicultural literature in association with safflower pollination[3].**

[8] **Thin-hulled seeds, on a seed weight basis, produce larger amounts of oil than seed without the *th* gene. The nutritious residue after oil extraction, often fed to livestock, is also increased.**

hulled lines as 'females', Urie and Zimmer found that hybrid seed formed under caged conditions with bee pollination had 16 to 43% contamination by 'female' selfs and sibs[9]. The progeny of these crosses were then planted under field conditions at five locations to study resulting yields. Using all the yield data, the average yields were 93.3% of the variety Ute. When only the results of when Ute was used as the "male" parent were considered, the yields were only 91.5% that of Ute. In addition, when the researchers planted normal hulled seed mixed with 10 to 60% thin-hulled seed (corresponding to the 'female' of a hybrid crosses) they found that yields steadily decreased with increasing amounts of the thin-hulled variety. Even mixtures of only10% thin-hulled seed failed to yield as much as the pure stands of the two normal varieties used in the study. The result is that the hybrid advantage was essentially lost and unless the competition between the hybrids and the contaminating low yielding *thth* plants can be eliminated or at least reduced, the full potential of the hybrids will be lost.

Other approaches to the formation of safflower hybrids have been tried. Heaton and Knowles[19] in 1982 introduced a recessive gene (*ms* for male sterility) that resides in the nucleus. In its heterozygotic state (in combination with the dominant *MS* gene) the effect of the *ms* gene is totally masked, but in its homozygous state (*msms*) it produces no fertile pollen. Two germplasm releases of the *ms* gene were made available to other plant breeders.

In another approach, Baydar and Gökmen[2] found that three successive treatments of gibberellic acid (GA3) reduced pollen viability to as low as 6.7%. In their studies, hybrid seed production was 72.6% in main heads, 82% in primary heads and 87.5% in secondary heads[10] with an overall average of 80.7%. It seems to me that unless the percentage yield of hybrid seed can be improved, the resulting progeny might suffer from the same problems uncovered by Urie and Zimmer[19]. In addition, gibberellic acid is a plant hormone that has many effects on treated plants and the treatments used by Baydar and Gökmen apparently resulted in a higher hull percentage and lower oil content of seeds from treated plants than from nontreated plants. These authors also suggest that there may be effects of the treatment that show up during the germination of the hybrid seed.

To date, there seems to be no perfect solution to the creation of safflower hybrids. Weiss[21] summarize the situation as, "Cytoplasmic male sterility would greatly assist breeders as it has done with other oilseed crops."[11]

As is always the case, no matter which hybrid seed production system is utilized, steps need to be taken so that foragers do not become conditioned to (prefer to work) one of the two lines. Rubis [18] found that bees could become conditioned to lines based on floral color. Also, when the numbers of 'female' to male rows were planted in ratios of 2:2, 4:2, 8:2 and 18:2 he found that the percentages of cross-pollination were 71, 63, 52, and 32 percent respectively, and in the 18:2 blocks the percentage of cross pollination decreased toward the central 'female' rows but was 79% in the 'female' rows that were adjacent to the two blocks of male rows, suggesting that the male and 'female' lines should be planted in alternate rows.

I personally wonder if interest in production of safflower hybrids will abate given the present decline in safflower production and the spectacular successes that are occurring in competing oilseed crops.

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[9] **This percentage is the combined result of both self-crosses and crosses with other thin-hulled plants in the same area, known as sibling or sib crosses.**

[10] **I interpret this head designation as: main heads—The top flower on the central plant stem, primary heads—flowers at the end of the branches and secondary heads—flowers along the branches.**

[11] **Currently other references to hybrid safflower seed production, including germplasm patents, can be found on Google.**

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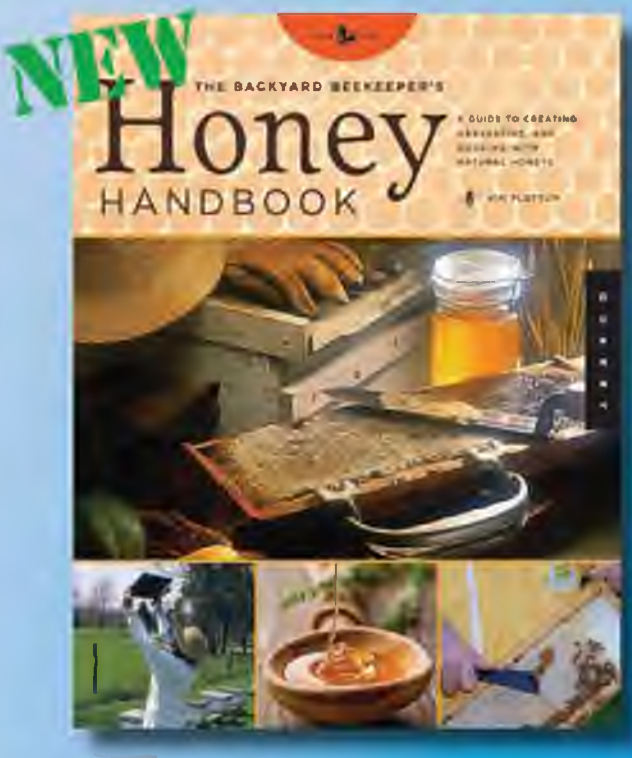

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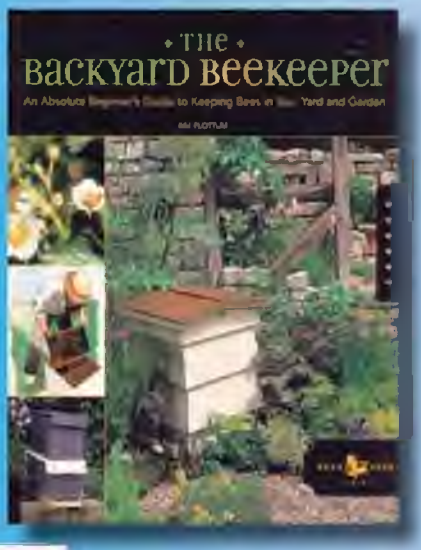

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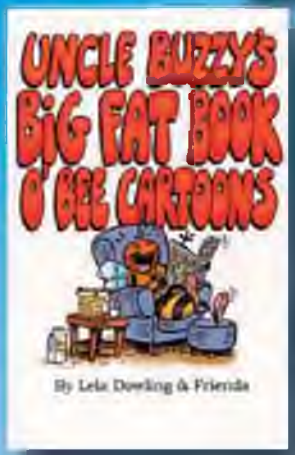

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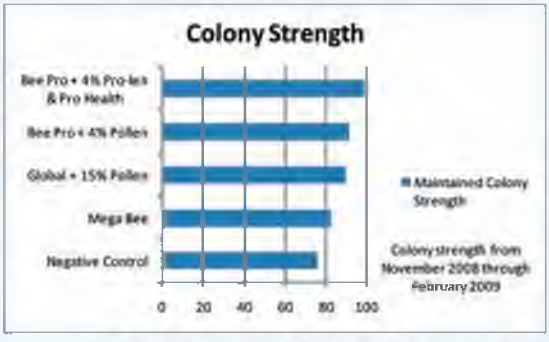

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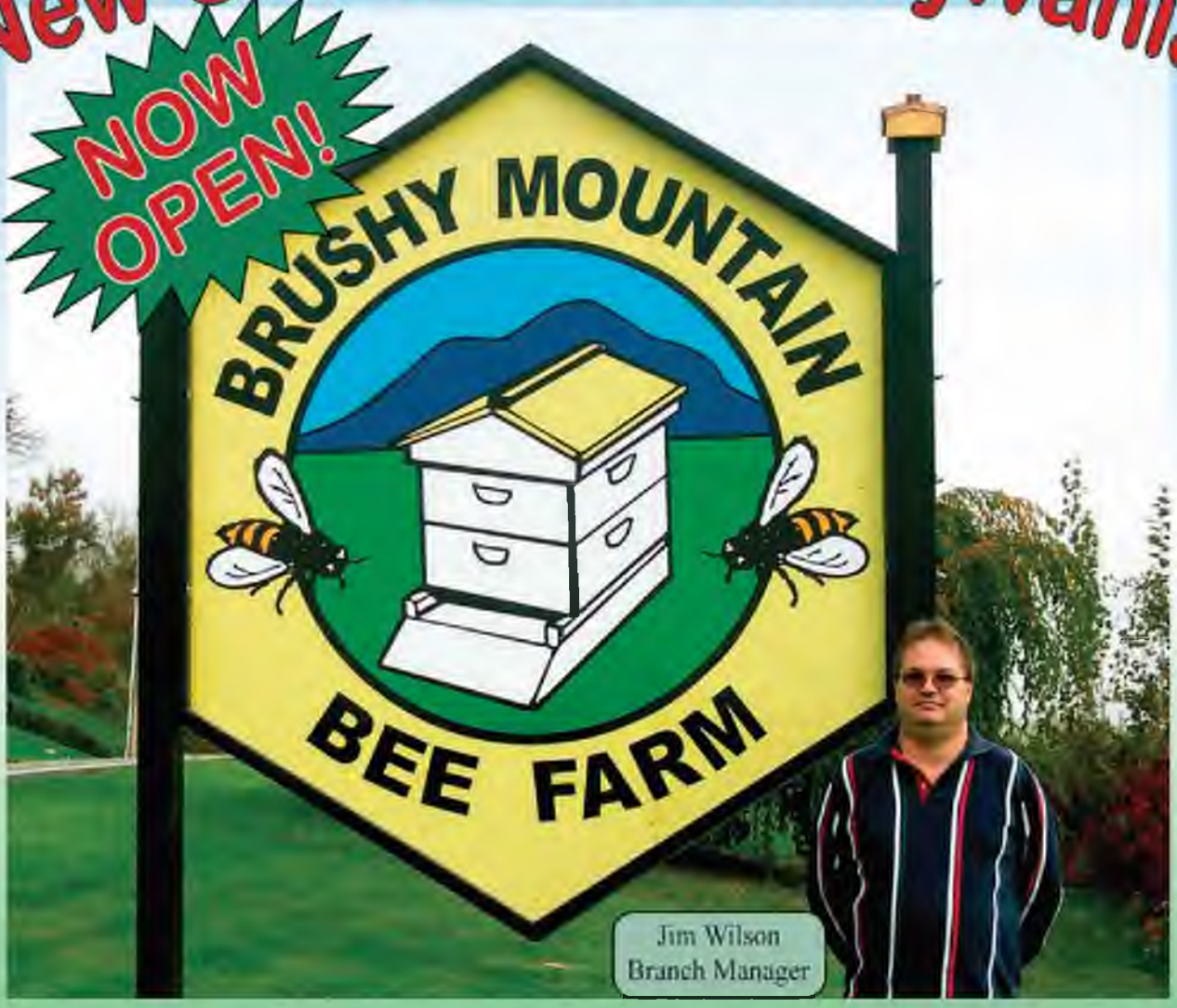

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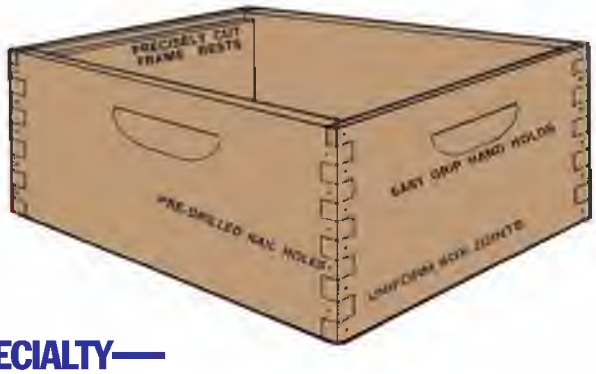

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Dadant Frame Construction

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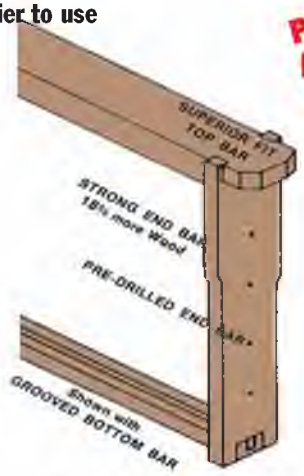
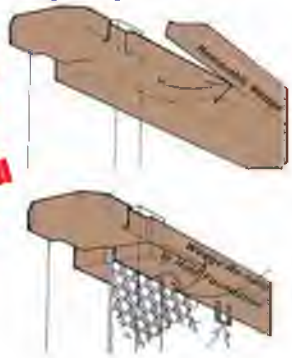
- Grooved bottom bar stronger and easier to use



—2 Frame Styles—

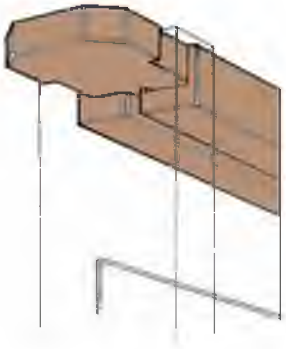
Wedge Top Bar

Pressed for time? Ask about our assembled frames with beeswax-coated plasticell foundation.



1) Wood wedge is removed from frame.
2) Foundation is placed in frame.
3) Wood wedge is held firmly against foundation and nailed or stapled in place.

Grooved Top Bar



Foundation is placed in bottom-bar groove and top-bar groove. This frame works best with a rigid foundation such as Duragilt or Plasticell.

NOTE: Unless otherwise specified, frames with grooved bottom bars will be shipped. SOLID AND SLOTTED BOTTOM BARS ARE AVAILABLE IN 100 OR MORE QUANTITY. Please specify bottom bar desired.

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