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VOLUME 150 NO. 7 JULY 2010

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July Cover Picture

Dr. Zachary Huang of Michigan State University took these beautiful photos of beehives in a Michigan buckwheat field and a close-up of a honey bee working buckwheat. Read more and see more photos on page 625 of our Letters section.

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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!

JULY COVER PICTURES

Dr. Zachary Huang of Michigan State University sent these beautiful buckwheat photos that he took while visiting Terry Klein, a long-time member of the Michigan Beekeepers Association. The buckwheat is grown by the state to attract ducks and the area is later flooded and used for duck hunting, according to Zachary. He helped Terry gain access to the buckwheat acreage for honey production by providing information to the state. Zachary said that in 2006 the State of Michigan had denied Terry access to the region, saying that buckwheat did not need bees.

Some of Terry Klein's hives ready for a good buckwheat honey flow.

According to Dr. S.E. McGregor in his monumental book published in 1976, *Insect Pollination of Cultivated Crops,* "The buckwheat flower is usually unable to self-pollinate. The flower type prevents the pollen from automatically coming in contact with the stigma…The necessity of insect pollination for commercial seed production of buckwheat has been well established by Garber and Quizenberry (1927) and numerous workers in Russia, where this crop is grown so extensively…Unquestionably, the honey bee is the best pollinator of buckwheat because it is highly attracted to the buckwheat flower and efficiently and effectively transfers the pollen from anthers to stigmas, whether collecting pollen or nectar."

Terry Klein (right) points out a honey bee working a buckwheat blossom as Dr. Zachary Huang prepares to take a photo.

"BEEKEEPERS GETTING STUNG BY A BEEKEEPER"

We have some midnight beekeepers in the area of Wisconsin and Minnesota who are in the business of stealing hives of bees. Another way they work is to offer you a service of wintering your bees in the South. They offer to pick up your bees and bring them back in the spring. You may or may not get all of your bees back. You may only get half of them and they may not be in your equipment. You might end up with a lot of junk.

What drives these people to steal? Is it the price of honey and the demand or is it the glory of being able to have enough hives to go for the Almond Gold of pollination out in California? Will it help to have all your equipment branded or your name painted on everything? I am not sure, but it might help a bit. On the nights of the 26th and 27th of April I lost 33 good one-story hives of honey bees that were ready for the second box. In 2009 I lost a lot more through a shady wintering deal in the South arrangement. Are these two related? This person knew where one of my best beeyards was located.

What can you do to prevent this? Don't fall for a wintering deal without a signed contract of exactly how it will go, have all your equipment with your ID and never show them where your yards are.

Been Stung Bad Twice,
Dale Wolf
Wolf Honey Farm
Baldwin, WI

STRAWBERRY POLLINATION

Here is a picture of strawberry pollination in Eagle, Nebraska. *(Photo courtesy of Robert C. Davis)*

WHAT HAPPENED TO BEE ETIQUETTE?

Is it because the new beekeeper[1] with all his fast ways of doing things and big machinery does not respect the old (long-time) beekeeper.[2] "Hurry up and get out of my way." I find that the new beekeepers don't look or scope out an area before dropping a hundred hives, whereas the long-time beekeeper has cleared the area and okayed it with the landowner. Nor does the new beekeeper check to see which beekeepers are in the area where he wants to put hives. "Drop, run and don't get caught by other beekeepers" seems to be the motto.

Also, those beekeepers who have a hundred or more hives in one place don't think about the other humans around there when they pick up the left-behind bees. That would mean they would have to come back and they don't want to do that. Instead, they leave it up to someone else to clean up what was left. The long-time beekeeper has had the same spot or territory for years. The territory for the bees hasn't changed. Yes, some groves are gone, but there are new ones. The same with other areas. There is no cause for any beekeeper to take away someone else's territory or overlap the area with bees, acknowedging there is a respect for the beekeeper who has been there for a long time. Yes, there is a lot of territory and a bee can fly at least a 2-mile radius. So, why are they in such a hurry to take one's spot?

The honey will be just as good in one spot as in another. The most is not always the best. "Quality first then quantity," is the long-time beekeeper's motto.

1 New beekeeper is one who is new to area or new at the beekeeping business

2 Old beekeeper refers to the beekeeper who has been in the area a long time or in the business for a long time.

Linda Struthers
Lake Wales, FL

ANGEL HONEY

Honey label designed by Christopher Menezes

This is one of my honey labels that I made 10 years ago with my daughter, Angel. She was 9 in this photo. I currently sell my honey to local farmer's markets and health food stores in Lehigh Valley, PA. Everyone seems to enjoy my honey and love my label, it's so unique! I am sending you this photo, hoping you will enjoy it just as much as everyone else does and hoping one day it will buzz in on one of pages in your magazine.

Christopher Menezes
Lehigh Valley, PA

CHARITY GROUP HELPS BEEKEEPERS IN SEVERAL COUNTRIES

We're buzzin' with news!! Beekeepers for Christ (BFC) has broadened its horizons while consulting on more projects worldwide!

- Mongolia - We are continuing to support the program to provide books for school children. We need someone to foster this ministry, teach beekeeping and financially adopt this ministry.
- Kenya - Consulting with David and his wife Susan about their prospective projects in southern Kenya. David will be teaching beekeeping while Susan develops a yogurt company.
- Sudan - Dan Mayer, the co-founder of BFC, contracted with Mophart and BBLTP to build smokers to send to a project along the Sudanese border along with the manuals sent out by Beekeepers for Christ.
- Ivory Coast - BFC is donating bee suits to send to the Ivory Coast for a beekeeping project there.
- Haiti - An in-depth new project has surfaced. There is a 200 acre established farm without a beekeeping project. We have a gentleman in the U.S. who has stepped up to lead this project. We have a goal in place.
- Uganda - Continuing to work on our project and ministry in Uganda from its meager beginnings using logs for hives to today's Langstroth hive-making classes, hive contracts and honey manufacturing; our Blessed Bee for Life Trading Post (BBLTP) project is nearly ready to spread its wings! We are just short of the funding needed to purchase the tools to take them to the next level; sustainability.

We are entering our final phase of the Uganda project by helping Blessed Bee for Life purchase a generator, table saw and other small wood-working tools. We will need $23,000 to complete this phase. GloryBee Foods, Inc. will contribute one-half or $11,500 towards this goal, but we are looking for matching gifts for the balance. Demand has surpassed their capability to produce.

We will continue to support their endeavor of becoming an established supply house for the region by the year 2011. By then, BBLTP will be prepared to handle the growing demand. This project is a *success* as it is now recognized as "the resource place" where people can get equipment for their own beekeeping projects, not only in Uganda, but in Sudan, Congo, Kenya and other countries. The BBLTP has become a major resource for the region by providing this equipment; it will increase their sustainability.

Beekeepers for Christ will continue to look for opportunitites where we can use the same concept as the Uganda project to bring a successful conclusion in other areas of the world. We will continue to work as a consulting resource for people who have projects of their own. We are not able to fund every project that surfaces in the region, but can provide information and expertise. We continue to support the Kei Health Center by providing food for HIV/Aids patients. A fall trip to Uganda is planned as the plans for an April trip were derailed due to the volcano in Iceland.

We will need your help to complete the final stage of this ministry and are only short a small amount to complete the purchase of the generator and woodworking equipment. If anyone's heart has a particular desire to be involved in this worthy ministry, please join us by sending your donations to *BFC, P. O. Box 2744, Eugene, Oregon 97402*. 100% of your tax deductible contribution goes directly to the project. Your check will be your receipt.

I have enjoyed sharing with you the incremental growth in each phase or project as we work diligently to fulfill God's plan for this ministry. It is with God's guiding hand that we work together to care for our neighbor as we would have him care for us.

Dick Turanski
GloryBee Foods, Inc.
Eugene, OR

MICROBIAL TEAM MAY BE CULPRIT IN COLONY COLLAPSE DISORDER

SAN DIEGO, CA – May 25, 2010 -- New research from the United States Department of Agriculture (USDA) has identified a new potential cause for "Colony Collapse Disorder" in honey bees. A group of pathogens including a fungus and family of viruses may be working together to cause the decline. Scientists reported their results in May at the 110th General Meeting of the American Society for Microbiology in San Diego.

"There might be a synergism between two very different pathogens," says Jay Evans of the USDA Agricultural Research Service, a researcher on the study. "When they show up together there is a significant correlation with colony decline."

Beginning in October 2006, some beekeepers began reporting losses of 30-90 percent of their hives. Although colony losses are not unexpected during winter weather, the magnitude of loss suffered by some beekeepers was highly unusual.

"Domesticated honey bees face numerous pests and pathogens, tempting hypotheses that colony collapses arise from exposure to new or resurgent pathogens," says Evans.

To better understand the cause of these collapses, in early 2007 Evans and his colleagues collected bees from both healthy and declining colonies across the country, but primarily from California and Florida where most of the commercial pollination activity takes place. They have screened these samples and similar samples from each year since then for both known and novel pathogens.

They found a slightly higher incidence of a fungal pathogen known as *Nosema ceranae* in sick colonies, but it was not statistically significant until they began pairing it with other pathogens.

"Levels of the fungus were slightly higher in sick colonies, but the presence of that fungus and 2 or 3 RNA viruses from the family Dicistroviridae is a pretty strong predictor of collapse," says Evans.

Nosema is transferred between bees via the fecal-oral route. When a bee initially ingests the microbes and they get to the midgut, they harpoon themselves into the gut wall and live inside the epithelial cells there. Evans believes that the slightly higher numbers of the fungus somehow compromise the gut wall and allow the viruses to overwhelm the bees. In colonies with higher Nosema numbers they found virus levels to be 2-3 times greater than healthy colonies.

While this is a working theory and they are still in the discovery phase looking for new pathogens, Evans and his colleagues are also actively looking for a way to boost bee defenses against Nosema.

"A way to protect against Nosema might be the key for now," says Evans.

A live interview with Jay Evans was web cast May 25, 2010, over the ASM Live uStream channel (**http://www.ustream.tv/channel/asm-live**).

SMALL HIVE BEETLE FOUND IN HAWAII

(Hawaii Dept. of Agriculture News Release)

HONOLULU - The Hawai`i Department of Agriculture (HDOA) has confirmed the presence of another serious bee pest, the Small Hive Beetle (SHB), in hives located near Hilo. The discovery of this new pest, in addition to the already established varroa mite, imperils the queen bee export and honey industry in Hawai`i. In response to this detection, the department has invoked the Incident Command System to coordinate and manage rapid response efforts. It is not known how the SHB arrived in Hawai`i.

On Tuesday, April 27, 2010, a beekeeper on a Pana`ewa farm contacted HDOA's entomologist in Hilo about beetles he found in the hives on the farm. The entomologist collected four beetles and together with HDOA entomologists in Honolulu made a preliminary identification. Samples of the beetles were confirmed as SHB on Friday, April 30, by the U.S. Department of Agriculture's National Identification Service in Riverdale, MD.

Staff from HDOA's Plant Pest Control and Plant Quarantine branches has already begun conducting surveys in the Hilo area. So far, adult and larval stages of SHB have been found at two sites. Surveys in West Hawai`i, where the majority of the queen bee operations are located will begin today. Staff from O`ahu and Kaua`i has been dispatched to assist Hawai`i Island staff in this labor-intensive activity to determine the extent of the infestation. Two teams will be working in the Hilo area and one team in West Hawai`i. HDOA is utilizing the Incident Command System, which is widely used for other emergency responses, to manage this pest emergency.

"The Small Hive Beetle will be difficult to eradicate and control because it also feeds on various decaying fruits which are abundant in the wild," said Neil Reimer, manager of the Plant Pest Control Branch. "We are working with the U.S. Department of Agriculture to develop a queen bee certification procedure that would allow for the continued export of clean queen bees to foreign and domestic areas."

HDOA staff is working with counterparts on the mainland to develop most effective treatment strategies that may control SHB.

SHB (*Aethina tumida*) adults are about four to five millimeters in length and are yellowish-brown in color, turning brownish, then to black as it matures. They feed on honey, pollen, wax, honey bee eggs and larvae and tunnel through the honeycomb, damaging or destroying the honeycomb and contaminating the honey. Symptoms of SHB infestation include discolored honey, an odor of decaying oranges, and fermentation and frothiness in the honey. Heavy infestations may cause honey bee colonies to abandon hives.

SHB is native to South Africa and was first detected in the U.S in 1996 in South Carolina. It was subsequently detected in Florida in 1998 and is currently found in many states in the South and Central areas of the U.S. and California. Although found in the U.S., SHB is under international regulation for export of queen bees and it is a concern that some foreign countries may impose restrictions on the importation of queen bees from Hawai`i.

Varroa mites were first found on O`ahu in April 2007, and later in Hilo in August 2008 and Kona in October 2009. To date, varroa mites have not been detected on Kaua`i or in Maui County.

HDOA is asking residents to report any backyard or feral bee hives to the State's toll-free Pest Hotline, 643-PEST (7378).

'HONEST HONEY' LAUNCHED TO PROTECT U.S. HONEY CONSUMERS AND CUSTOMERS

Duty circumvention a threat to U.S. honey industry, honey supply quality

WASHINGTON, May 6, 2010 - Four North American honey marketing companies and importers - Golden Heritage Foods, LLC, Burleson's Inc., Odem International, and Dutch Gold Honey - today launched the Honest Honey Initiative and pledged to help protect the quality and reputation of the U.S. honey supply, as well as the sustainability of U.S. beekeepers and honey businesses. The initiative seeks to call attention to illegal sales of honey in circumvention of U.S. trade laws, a practice that the organizers estimate cost the United States up to $200 million in uncollected duties in 2008 and 2009 combined and threatens a vital segment of U.S. agriculture.

The group unveiled a website, HonestHoney.com, an educational resource providing information about where honey comes from and ways consumers, honey companies, food manufacturers and retailers can take action to eliminate illegally imported honey.

"When honey is imported illegally, no-one can be confident of its true source and

quality. Some products are not 100% honey and have other quality issues," said Jill Clark of Dutch Gold Honey, Lancaster, Penn. "We're asking people who buy and love honey to find out more about how the honey they enjoy is sourced. By raising awareness of unfair trade practices and taking the Honest Honey pledge, we hope to protect consumers and manufacturers who use honey, and to preserve the fair honey trade."

While many Americans purchase packaged honey, an even broader population enjoys honey in such products as cereals, breads, cookies, crackers, breakfast bars, meats, salad dressings, barbeque sauces, mustards, beverages, ice creams, yogurts and candies.

"Pick an aisle at the grocery store and you'll probably find at least one honey product there," said Clark. "It's a product that is added because of its wholesome, pure quality and taste, which is all the more reason why this issue is important."

"I'm glad that efforts like Honest Honey are educating people, because the quality of honey does matter - it matters to consumers and it matters to our nation's bee industry," said Dennis vanEngelsdorp, a honey bee researcher at Pennsylvania State University. "Illegally imported adulterated honey simply adds yet another problem to an already hurting bee industry."

"We estimate that millions of pounds of Chinese honey continue to enter the U.S. from countries that do not have commercial honey businesses," said Clark. "For example, countries such as Indonesia, Malaysia, Taiwan, Thailand, the Philippines and Mongolia raise few bees and have no history of producing honey in commercial quantities, yet have recently exported large amounts of honey to the United States.

"Honey has earned a special place in people's hearts and minds as a wholesome, natural food. We want to protect that reputation and quality," said Clark.

The Honest Honey Initiative is an effort by a number of honey companies and importers to call attention to the problem of illegally sourced honey; to encourage action to protect consumers and customers from these practices; and to highlight and support legal, transparent and ethical sourcing. The initiative seeks to help maintain the reputation of honey as a high-quality, highly valued food and further sustain the U.S. honey sector. Learn more at **www.HonestHoney.com**.

NATIONAL HONEY BOARD FUNDS NEW RESEARCH FOCUSING ON HONEY BEE HEALTH

FIRESTONE, COLO. – The National Honey Board (NHB) will fund several new projects in 2010 related to a variety of bee colony health issues. Funding for the projects totals $95,137. The goal of the research is to help producers maintain colony health while assuring the maintenance of honey quality, with areas of interest being control of *Varroa destructor, Acarapis woodi, Nosema ceranae, and small hive beetle; the investigation into the causes and controls of Colony Collapse Disorder; and honey bee nutrition, immunology, and longevity.*

New projects approved for funding in 2010 include:

- "The costs of following the bloom – nutrient processing, microbial dynamics, and colony health in a migratory beekeeping operation (Jan. 2010- Dec. 2010)," Drs. Mark J. Carroll, Diana Sammataro, and Gloria DeGrandi-Hoffmann, USDA-ARS, Carl Hayden Bee Research Center, Tucson, AZ.
- "Dealing with *Nosema ceranae* – infection cycles and treatment needs and approaches," Richard Fell, Brenna Traver, Virginia Polytechnic Institute and State University.
- "A long-term plan to improve honey bee genetics: formation of a tech transfer team," Marla Spivak, University of Minnesota.
- "Is it possible to obtain accurate nosema and mite counts from a single sample of bees from the entrance?" Randy Oliver.

The NHB also approved a contribution to Penn State University's Center for Pollinator Research to support the July, 2010 International Conference on Pollinator Biology, Health and Policy.

The National Honey Board conducts research, advertising and promotion programs to help maintain and expand domestic and foreign markets for honey and honey products. These programs are funded by an assessment of one cent per pound on domestic and imported honey. The National Honey Board is an equal opportunity provider and employer. *(National Honey Board News Release)*

NATIONAL HONEY BOARD PROVIDES REVAMPED EDUCATIONAL TOOLS FOR CHILDREN

FIRESTONE, COLO., – The National Honey Board has revamped its educational materials for children, creating a fresh look and feel to excite children about using honey. The two brochures, one educational and one recipe-based, are available for free (in limited quantities) to interested members or associations in the honey industry.

The educational brochure, *A Sweet Story: The Making of Honey*, describes how honey is made and includes a game and a quick and simple recipe. This fun and lighthearted brochure is primarily geared toward children 9 to 12 years old, but is suitable for younger children as well.

The children's recipe brochure, *From Honey Bees to Brain Freeze*, is a kid's ultimate guide to cooking with honey. From snacks to dinner to dessert, this brochure provides plenty of easy-to-follow recipes that are delicious and fun to make.

If any honey industry member or association is interested in obtaining copies of these brochures, please email Andrea Brening at andrea@nhb.org, or call (303) 776-2337. For more information on the National Honey Board, please visit www.honey.com, follow us on Twitter (Twitter) or become a fan on Facebook (Facebook). *(National Honey Board News Release)*

BEE ART

Olga Barmina, a staff research associate at U.C. Davis, shows her glass-fused plate that was featured at the bee-themed art show on Saturday, May 8 in the *Sacramento Bee's* open courtyard. A portion of the proceeds will benefit honey bee research at U.C. Davis *(Photo courtesy of Kathy Keatley Garvey, U.C. Davis, Dept. of Entomology)*

MASSACHUSETTS

July 29- Aug 1

2010 Northeast Treatment-Free Beekeeping Conference
Leominster, MA

The focus of this year's conference is "What is the smaller beekeeper to do?" We will be hearing from several commercial beekeepers who have eliminated treatments in their operations, how they achieved their goals, and what they can recommend to smaller beekeepers who don't have the advantage of hundreds of hives to start with.

Hands-on hive openings, top bar hives, panel discussions, and innovative increase methods will be highlighted.

Kirk Webster: Treatment Free Commercial Beekeeper/Breeder, VT
Dee Lusby: Treatment Free Commercial Beekeeper/Breeder, AZ
Sam Comfort: Former Commercial Beekeeper/Current Top Bar Beekeeper

/Breeder, NY/FL
Mike Palmer: Commercial Beekeeper/Breeder, VT
Erik Osterlund: Treatment Free Commercial Beekeeper/Breeder and Journal Editor, Sweden
James Fearnley: Propolis Expert/Author and founder of BeeVital, UK
Yoon Sik Kim: Treatment Free Beekeeper/Writer/Poet, OK
Corwin Bell: Treatment Free Beekeeper /Bee Activist, CO
Bruce Brown: Hive Product Merchant (Owner of C.C. Pollen), AZ
Laurie Herboldsheimer: Treatment Free Beekeeper/Author, MA
Dean Stiglitz: Treatment Free Beekeeper /Author, MA

The venue is the beautiful Doyle Conservation Center in Leominster, the cost is $190 and includes 10 home-cooked meals.

The material here will be intermediate to advanced in nature…nothing difficult for a beekeeper with a couple of years experience. If you are new to beekeeping, we strongly recommend that you either come for the Beginning Treatment-free Beekeeping Intensive, or read our book for a background in the basics.

This year, we are also adding:
July 28-29, Beginning Treatment Free Beekeeping Intensive.

This is a 2-day course in beginning beekeeping from a treatment-free perspective. Thursday evening dinner will be shared with attendees arriving for the conference and we will have a program after dinner. Classroom instruction and course materials are provided. There will be hive openings, and an observation hive on site.

We are especially lucky to have Sam Comfort of Anarchy Apiaries join us. His expertise in top bar hive management places him in high demand as a speaker and teacher. Sam has wide ranging skills and experience (from bee breeding to almond pollination).

No Previous Experience Necessary.

The venue is the beautiful Doyle Conservation Center in Leominster, MA the cost is $60 and includes 6 home-cooked meals.
http://beeuntoothers.com/2010Conference.html

CONNECTICUT

Backyard Beekeepers Association

During the summer on most Sundays between 11 a.m. and 3 p.m. the BYBA's club wide queen rearing yard is open, please come visit. Each month we have timely inspection weekeends hands-on workshops, 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.backyard beekeepers.com
July 10: Hive Inspection Part 3: Mary Howansky
July 24: Honey Harvest: Ellen Zampino
Sept. 28: Stan Schneider "Caste Interactions and Their Role in Colony Reproductive Decisions in the Honey Bee"
Oct. 26: Jennifer Berry "Sub-lethal effects of in-hive pesticides"
Nov. 30: Allen Hayes on his unusual beekeeping tools and gadgets

NEW HAMPSHIRE

Tracheal and Varroa mites are notorious killers of bees in New England. American Foulbrood disease is on the increase as dead hives are being robbed. Beekeepers must take timely steps to control these pests to SAVE THE BEES! Charles Andros, former NH/VT Apiary Inspector, will hold a beekeeping workshop from 1 - 3:30 p.m on Saturday, July 10, at 18 MacLean Road, Alstead, NH 03602. Look for the "BEE" sign on the south side of Walpole Valley Road. The topics of discussion will be taking off and extracting honey, wax processing, treatment of mites and foulbrood, and making propolis tincture. Bring a veil, if you have one, as we shall be opening some colonies. We'll be inside if it is a rainy day. Water and chair may also come in handy. Registration required. email: **lindena@sover.net** or call 603-756-9056.

VERMONT

The Vermont Beekeepers Association will hold their annual summer meeting Saturday, July 24, 2010 at the Long Trail School in Dorset, VT. Registration & refreshments begins at 8:30 a.m. Meeting runs from 9:15 a.m. - 4:00 p.m. A potluck lunch will be served. Guest speaker: Prof. Marla Spivak of the University of Minnesota. For more information call Bill Mares 802-863-4938 or email: **bill.mares@gmail.com**

NEW YORK

Apprentice Level Fall Course 2010

The Cornell University Master Beekeeper Program will conduct its one-day Apprentice Level Fall Workshop twice this year. This is a comprehensive course that picks up where the spring class left off. It covers summer, fall and winter management; honey removal, extraction and processing; and IPM for honey bee pests, parasites, pathogens and predators. New beekeepers and experienced beekeepers looking for a refresher course are encouraged to attend. Class runs from 9am-6pm and includes 2 hrs of field work. Cost is $85.00. A workshop manual and refreshments are provided. For registration materials, go to **masterbeekeeper.org**. Classes limited to 24.

Offered at these times and places:
Saturday, August 14th
Dyce Lab, Cornell Univ. - Ithaca, NY
Saturday, August 21st
Betterbee - Greenwich, NY

PENN STATE POLLINATION CONFERENCE

The Penn State Center for Pollinator Research is Sponsoring an International Conference on Pollinator Biology, Health and Policy

Pollinators are essential for both plants and animals in agriculture and natural ecosystems, but there have been dramatic declines in pollinator populations worldwide. Pollinator decline has not only alarmed the scientific community, but gained prominence in the popular press, raising the public's awareness about threats to our ecosystem. The causes for pollinator decline are complex, and it is thought that a combination of many stressors are responsible, including pests, pathogens, environmental toxins, and disruptions in landscape ecology resulting in reduced nutrition and habitat. Addressing these issues will require multidisciplinary research approaches, the development of novel management and conservation practices, and a strong commitment to disseminate the results of these studies to students, the public, and policymakers. As part of its commitment to address pollinator health and conservation, Penn State has recently established a Center for Pollinator Research, comprising 26 independent research, extension and outreach groups across the university. One of the first goals of this Center is to bring together researchers, policymakers, and conservationists in an international conference on pollinator biology, health and policy, to begin to bridge the gaps in our knowledge that are necessary to address this complex issue.

When: Saturday, July 24, 2010 12:00 p.m. -Wednesday, July 28, 2010 p.m.
Where: The Nittany Lion Inn, State College, Pennsylvania 16803. 800-233-7505

For Registration Questions Contact:
Office of Conferences and Short Courses, The Pennsylvania State University, College of Agricultural Sciences, 301B Ag Admin Building, University Park, PA 16802
Toll free: 877-778-2937 or local 814-865-8301
Email: **csco@psu.edu**

For Program Questions Contact:
Christina M. Grozinger, Associate Professor, Department of Entomology, Director, Center for Pollinator Research, Center for Chemical Ecology, Huck Institutes of the Life Sciences, Pennsylvania State University, Chemical Ecology Lab 4A, University Park, PA 16802

Phone: 814-865-2214
Fax: 814-863-4439
Email: **cmgrozinger@psu.edu**
Webpage: **http://www.grozingerlab.com**

PENNSYLVANIA BACKYARD BEEKEEPERS ASSOCIATION

A newly formed bee association has emerged called the "Pennsylvania Backyard Beekeepers Association" or the PBBA. The PBBA is administered under the non-profit corporation status of Pennsylvania Apiculture Inc. (PENNAPIC). The association membership is open to all beekeepers, those interested in helping the honey bees, and all nature-loving individuals. We invite everyone to join the PBBA. The PBBA is focused on helping the backyard beekeeper with quality interactive social events, education, and support of the honey bee industry. We participate and support many other gardening, agriculture, environmental, and nature oriented groups.

The PBBA will be assisting in hosting of the annual summer picnic scheduled for July 31, 2010. The (7th annual) picnic, regularly hosted by Bjorn Apiaries and Oxbow apiaries at 180 Century Lane, Dillsburg, Pa. 17019, is open to all beekeepers from across the region and outside the state. A round table discussion of the coming events and programs of the PBBA will be offered.

More information on the Pennsylvania backyard beekeepers association, details of the upcoming picnic, as well as other programs administered by PENNAPIC can be found at www.pennapic.org or by calling 717-938-0444

PENNSYLVANIA

Delaware Valley College Summer Beekeeping Course

Delaware Valley College will present its annual summer Beekeeping short-course July 16, 17 and 18 (9 a.m. to 4 p.m. daily).

This course is suitable for beginners and as a refresher course for more experienced beekeepers. This three-day course will combine lectures with hands-on experience in our bee yard. Topics to be covered include honey bee biology, communication (dance language and pheromones), beekeeping equipment, how to obtain and hive bees, how bees make honey, important nectar plants, harvesting and processing honey. Additional topics will include summer splits, spring, summer and fall management techniques and over-wintering nucs.

This course will be offered by Dr. Vincent Aloyo, a beekeeper with over 40 years of experience and Dr. Christopher Tipping, assistant professor of biology.

The cost of the three-day course is $160. To register and for more information contact the Department of Continuing Education at Delaware Valley College.

Phone: 215-489-4848, Fax 215-345-1599
Email: ContEd@delval.edu Or visit our web site: **http://delval.edu/cms/index.php/delval/departments_sn/continuing/C251/**

WEST VIRGINIA HONEY FESTIVAL

August 28-29, 2010
Wood County, City Park, Parkersburg, WV

Honey Princess, Baking Contest, Honey & Wax Show, Honey Extracting, Beebeards by Steve Conlon & Family, American Honey Queen plus more! A family event at a family park.
http://www.wvhoneyfestival.org

Contact: Tom Riddle, President 304-481-6941, **teber1029@suddenlink.net**, or Wood County Visitors Bureau 1-800-752-4982, or (304) 424-1960 (WVU Ext. Service), WV Honey Festival, P.O. Box 2149, Parkersburg, WV 26102

Driving directions from major highway/interstate **3 miles West of 177 off US Rt 50 (7th St.) or 4 miles East of US 50 bridge to OHIO: follow signs**

Parking availability and fees: **NO fee for parking**.

Fee/Admission charges **$2.00 adults and $1.00 children**

Gospel, country and pop-live music, antique car show PLUS anything you want to know about honey, beeswax and bee products! Wonderful crafts and good food too!

SOUTH CAROLINA

The South Carolina Beekeepers Association will host its summer meeting at Clemson University, Clemson, SC on July 15-17, 2010. The meeting will be held in the Poole Agricultural Center Auditorium.

Meeting registration will begin at 12:00 noon in the lobby of the Poole Agricultural Center on Thursday, July 15, and the meeting will end at noon on Saturday, July 17. There will be a $10 registration fee for association members ($15 family) and a $15 registration fee for nonmembers.

The meeting will begin at 1 PM on Thursday with a 1-day beginner level beekeeping short course which will be taught by Mike Hood and other instructors. Featured speakers for the general sessions and workshops to be held on Friday and Saturday will be Maryann Frazier from Penn State University, Mark Carroll from the Carl Hayden USDA Honey bee lab in Tucson, Arizona, Laurence Cutts from Chipley, Florida, Ohad Afik from the University of Georgia honey bee lab, Athens, Georgia, and Jerry Freeman from Hamburg, Arkansas. Some of the topics to be covered will include: Africanized honey bees in Florida, honey bee health and nutrition, varroa mite and small hive beetle control, the chemical world of honey bees, new beetle traps, pesticide residue analysis, an update on colony collapse disorder in the US, beekeeping in Israel, and many other talks on beekeeping. On Friday afternoon, speakers will lead small-group workshops where beekeepers will have the opportunity to discuss many topics relative to beekeeping.

Friday evening activities will include a barbecued pork/baked chicken dinner ($7/plate), horseshoe pitching contest, smoker lighting contest, and great fellowship with other beekeepers. A honey and beeswax competition will be held during the meeting.

All beekeepers or anyone interested in beekeeping are invited to attend for a good time of education and fellowship. For further meeting information and lodging arrangements, contact Mike Hood, Executive Secretary - SCBA at (864) 656-0346, email: **mhood@clemson.edu** or check out the South Carolina Beekeepers website: <**scstatebeekeepers.org**>.

TENNESSEE

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

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

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

FLORIDA

Honey Bee Awareness Day

National Honey Bee Awareness Day to be held at Dadant's in High Springs, Florida all day the 21st of August, 2010. Full day classes, demonstrations, door prizes, auction with Laurence Cutts, open hive demonstration, plus much more. Great food and drinks. Special guest speakers include Dr. Jaime Ellis from the University of Florida, Entomology Dept., Jerry Hayes from the Department of Apiary Inspections, plus many more TBA. For more information contact **chappiesbee@windstream.net**

MICHIGAN

2010 Queen Rearing Class at the Connor Farm in Galesburg, MI

July: Introduction to Queen Rearing
July 23, 24 and 25
2010, 9776 E. HJ Ave, Galesburg
Friday- 2 pm – 8 pm, Sat/Sun-9 am-3 pm
Fee: $275, includes Queen Rearing Es-

sentials and supplies, breaks. Limited enrollment.

This course is for the beekeeper with minimal queen handling experience who wants to raise a few queens to several hundred over the course of the season. EMPHASIS ON MAKING SUMMER INCREASE NUCS (NUCOLOGY) AND USING YOUR OWN QUEEN STOCK.

All the basic aspects of queen rearing: starters, finishers and mating nuclei, will be set up and put into operation by students. This is hands-on beekeeping instruction in a small group environment! We will spend time discussing queen management from finding, replacing, introducing, using cells, virgins and mated queens and a whole lot more.

Camping at Fort Custer and Motels in Kalamazoo and Battle Creek, some as low as $30/night.

To Register, click on the Wicwas Press Website **www.wicwas.com**, or send payment to Wicwas Press 1620 Miller Road, Kalamazoo, MI 49001 Phone (203) 435 0238

OHIO

Latshaw Apiaries
2010 Instrumental Insemination three Day Course

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

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

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

SOUTH DAKOTA

The South Dakota Beekeepers meeting will be held in Aberdeen, South Dakota on July 9 and 10 of 2010 at the Ramkota Inn. To make reservations call 605-229-4040. The rooms will be held for us, so be sure to ask for the South Dakota block. The rates are $84.99 + tax.

The general meetings will start at 1 p.m. Friday the 9th with speakers and other information. The banquet and auction will be held Friday evening. Saturday morning will be speakers and an informal session with the business meeting starting around 10:30 am. Advisory board meeting will start at 10 a.m. Friday, prior to the general meeting.

"The Best Extractors in the Business"

6-12 Frame Radial Extractor with Motor

6-12 Frame Radial Extractor—No more hand reversing of frames - uncap, load, extract, and unload. Reel capacity 6-9 1/8" deep frames; 12-6 1/4" or shallow frames. Frame guides provide positive frame placement. Ball bearings top and bottom. Powered by specifically designed direct drive motor with manually controlled electronic speed control. 120 v. operation. All welded 24" dia. 28" tall Type 304, 20 gauge stainless steel tank with inverted coned bottom and 1 1/2" welded fitting. 1 1/2" plastic honey gate w/barbed adapter included. Stainless steel stand sold separately.

M00411 6-12 Frame Extractor
Ships Freight Only
Ship Wt. 105 lbs. **$1,169.00**

M00415 Stand Only, Sold separately.
Ships Freight Only
Ship Wt. 70 lbs **$119.00**
(both items ship freight only)

20 Frame Radial Extractor

- 4 Section Reel
- Type 304 Stainless Steel
- 20 Gauge Stainless Steel
- Holds Any Size Frame
- 20 Individual Frame Pockets
- Can Hold Up To 36 Frames
- 30" Diameter 28" High

All Dadant Extractors are Made With Gauges of Steel Heavier than our Competitors!

The ideal choice for a growing extracting operation. From a few colonies to several hundred, the 20-frame radial is excellent. Comes complete with welded drain (2" Female Pipe thread) with 2"to 1 1/2" reducer bushing. A powerful variable speed direct drive motor powers the unit. 120 v. operation. (Stand sold separately).
M00440 20 Frame Radial, Ship Wt. 120 lbs—Ships Freight Only. **$1,499.00**
M00444 Stand only, Ship Wt. 70 lbs—Ships Freight Only. **$130.25**

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TWICE as THICK as our competitors

➪ We use Type 304 stainless steel. This may not mean anything to you, but it is the most widely used and accepted stainless steel in the food-processing industry, because of its resistance to rust and corrosion to protect your honey.

➪ We use stainless that in some cases is almost TWICE as THICK as our competitors' stainless steel. You want durability? Here it is.

➪ Sheets of stainless steel are difficult to permanently join together. Instead of using the old technology of soldering, caulking or crimping stainless steel together, we use state-of-the-art, Automatic MIG welders to actually melt and weld our stainless steel together. Smooth welds inside and out that won't ever leak. No sealants are used to hide poor quality welds and prevent leaks. Dadant manufacturing standards are rigid. We meet them on each and every all-welded stainless steel tank sold. Each tank is tested before it leaves the factory.

➪ A team of 15 is involved in the over 25 steps it takes to make the durable, efficient and sanitary stainless steel extractors from Dadant.

UNITED STATES

A continued honey shortage in the United States and the world, in general, will translate to continued strong wholesale and retail honey markets during the remainder of 2010. Despite the economic troubles in parts of Europe and the United States, the demand for honey is expected to remain fairly strong, buoyed by the natural foods movement and a general increased concern for the environment.

U.S. honey crops and honey crop prospects look improved over last year's record poor season. Starting in the Southeast, Southwest and West early reports have been mixed, but generally are better than last season. Although colony losses were again quite high, beekeepers were helped in their restocking efforts by good weather in parts of April and May that allowed for good bee buildup. One troubling fact often mentioned by seasoned beekeepers is that they are spending much more time and money every year just to restock deadouts and then try to keep colonies healthy through the honey flow season.

Good winter snows and spring rains over much of the country should help promote plant growth and nectar production. However, beekeepers stressed that the other part of the equation that must be met is warm, sunny weather during the important spring and summer honey flows. Rainy, cool weather throughout much of the 2009 spring and summer hurt honey flows in many parts of the country.

NORTHEAST—Colonies continued to build up well on spring sources, although cool, rainy weather at times delayed colony development in April and May. However, temperatures warmed in late May and June, so colonies were able to actively forage on remaining black locust, tulip-poplar and wildflower flows. Some reporters said that they expected to harvest one or more supers from these spring sources. Clover flows from white Dutch clover and yellow sweet clover should begin in June and will be followed later by buckwheat bloom in areas where this crop is still grown. Beekeepers are optimistic about remaining flows since ground moisture conditions are mostly normal.

Some beekeepers had trouble obtaining packages or nucs this spring due to the large demand. In some cases prices were up due to the demand and increased costs of production. A number of beekeepers also made divides in an effort to rebuild their colony numbers. The wholesale honey market is expected to remain slow until new crop honey comes back on the market.

MIDEAST—Some beekeepers in the Nashville, TN area suffered devastating colony losses due to flooding caused by torrential spring rains. Elsewhere, spring buildup was generally good, despite heavier than normal winter colony losses suffered by some beekeepers. In some cases black locust, tulip-poplar, berries and numerous wildflowers provided excellent spring flows where rain did not severely curtail flows. Prospects are good for later flows from clover, alfalfa, basswood and thistle. Beekeepers in the mountains are also hoping for a good sourwood flow this season.

Beekeepers are anxious to extract their first supers of honey since many have been sold out of inventories since last fall. Demand for honey at both the wholesale and retail levels remains excellent.

SOUTHEAST—The honey production this season has been better than last season, but as always, some locations did not have good weather during their main flows, so they missed out on good crops. Cool, rainy weather was a big factor during the first part of spring, but once the warm temperatures returned, everything seemed to bloom at once. Those beekeepers with medium to strong colonies made some good honey crops. Florida beekeepers report excellent orange flows in some parts of the state, but the tupelo flow in the panhandle area was judged to be about half of normal due to the weather. As this was written, bees were still making honey from gallberry and palmetto. Future prospects in Florida included palmetto, Brazilian pepper, wildflowers and melaleuca.

An update on the northern Florida and southern Georgia gallberry flow is not very encouraging. Many beekeepers are reporting only one-half to two-thirds of a normal crop. The situation is especially discouraging for beekeepers in this big comb honey production area since gallberry often provides the main source for this premium product. Beekeepers are blaming earlier cold weather, which seems to have affected gallberry nectar production. Another factor is that the extremely late and long orange honey flow prevented some beekeepers from moving their colonies to gallberry in time to take advantage of the first part of this important honey flow.

In Georgia, colonies were also making honey from tulip-poplar, berries and early palmetto. In Mississippi, good flows had been received from privet hedge, rattan vine, tulip-poplar and clover. Alabama beekeepers mentioned some of their best flows to date had come tulip-poplar, blackberry and clovers. Along the Gulf Coast, tallow also produced some nice honey crops.

Reporters continue to note encouraging hobby beekeeper interest, as well as an excellent demand for locally produced honey. Since honey inventories have been very low for several months now, packers are eagerly bidding on new crop honey and the retail buyers are very glad to see some of their favorite local honeys available again. Wholesale prices for new crop orange and gallberry honey are often being quoted at $1.50 to $1.60 per pound and $1.40 to $1.50 per pound for darker grades. Some small-lot prices are higher.

SOUTHWEST—After a cool, rainy spring Texas beekeepers were seeing some excellent flows from brush, assorted trees and bushes. Specific flows mentioned included tallow along the Gulf Coast, assorted berries, rattan vine, yaupon, clover and alfalfa. In the normally drier western portions of this area late rains and cooler weather had kept desert wildflowers, as well as irrigated crops like alfalfa, blooming much longer than normal. In addition, localized flows such a mesquite and horsemint were also being received. Cotton should begin blooming soon and in parts of Texas where it is grown excellent honey crops can be secured. In parts of Arkansas and Louisiana beekeepers were hoping for later soybean flows. Earlier flows from privet hedge, berries and assorted wildflowers were fair to good. As this was written clovers were still in bloom due to the extra moisture. In Oklahoma, many wildflowers such as vetch were in bloom, in addition to sweet clover and alfalfa.

Honey inventories are very low, so the new crop honey will be most welcome at both the wholesale and retail levels. In fact, many local honey varieties have been unavailable for quite some time.

EAST CENTRAL—As this was written

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

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

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

HONEY MARKET FOR THE MONTH OF APRIL 2010

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

(From MAY 2010 USDA National Honey Report)

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

-Report includes both new and old crop honey-

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

Arkansas - Soybean light amber $1.34
Dakotas - Clover white $1.55 - $1.65
Florida - Orange white $1.50 - $1.60
Louisiana - Tallow light amber $1.35

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

Province Not Reported
Canola white $1.66
Mixed Flowers white $1.54

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

Argentina
Mixed Flowers white $1.45 - $1.58
Mixed Flowers extra light amber $1.44 - $1.58
Brazil -Organic white $1.73 - $1.75
Mixed Flowers extra light amber $1.42 - $1.59
Mixed Flowers light amber $1.35

in late May, white Dutch clover and yellow sweet clover had both come into bloom and bees were making honey. If warm, sunny weather continues through June, beekeepers anticipate making good honey crops from clover and alfalfa. The problem a number of beekeepers have mentioned is that they have been losing so many colonies every year. Therefore, they often end up building up divides, nucs or packages on the main flows rather than making surplus honey from them. On the other hand, successfully overwintered colonies built up extremely well and reporters in some parts of the East Central area indicated heavier than normal swarming.

April weather was warmer and drier than normal, which helped bee buildup. Then, May rainy weather slowed colony foraging, but the added moisture helped clover growth and bloom. Unfortunately, a number of our reporters said that they missed the black locust flow due to several days of cool, rainy weather. This was especially disheartening this season since the black locust bloom was heavy and held much potential. Bees were also working many wildflowers, bushes and trees including berries, catalpa. Basswood bloom will be starting soon. Bees are working white Dutch clover, yellow sweet clover and alfalfa heavily now as weather conditions permit. White sweet clover will also start blooming in June.

Due to the extremely wet conditions in some parts of this area, more soybeans may be planted in place of corn. However, even with larger bean acreages, hot, sunny weather will be needed in order to obtain good flows from this fickle nectar producer.

WEST CENTRAL—Beekeepers are optimistic about honey flows from clover and alfalfa this season. Colonies have built up well and moisture has been adequate to insure good plant growth and bloom. April was warmer and drier than normal, which gave colonies a growth boost at a critical developmental time. Then, rains in May helped replenish ground moisture levels for alfalfa and clover growth. Those beekeepers who had to recoup huge colony losses will not be able to take full advantage of these anticipated good flows, unfortunately. As this was written, most of our reporters were hoping for a period of warm, clear weather in June to allow good bee foraging on clover and alfalfa. In areas with large concentrations of basswood beekeepers were also hoping for a nice flow from this source. Good soybean honey flows will need continued hot, clear weather, interspersed with occasional showers.

Both wholesale and retail demand for locally produced honey remains excellent, but few beekeepers still had unsold honey to sell. Current wholesale prices are in the $1.60 plus range for white honey and about 5 to 10 cents less per pound for amber grades. Reporters suggested that with continued strong demand prices should increase

to $1.70 or more for large lots of new crop white honey. Smaller lots will probably receive more. Retail honey demand also continues to be strong, but few stocks remained available.

INTERMOUNTAIN—After a slow start, colonies were building up well on wildflowers and fruit bloom. Those colonies being returned from California almond pollination were generally strong, but beekeepers who overwinter had to restock a number of deadouts. Ground moisture and reservoir levels were generally adequate for the present, so beekeepers were hoping for clear, warm weather during the clover and alfalfa blooms. In the mountains, cooler weather continued well into May with some locations still receiving measurable snowfall.

Most beekeepers were sold out of last year's honey crop, but they were receiving a lot of interest from packers, bakeries, etc. for new crop honey. Prices are expected to increase due to the heavier demand. At the retail level, demand for locally produced or specialty honey also continued to be quite good.

WEST—Beekeepers were cautiously optimistic about their honey crops this year since ground moisture and reservoir levels have been replenished by winter and spring rains. Rainy weather had delayed or curtailed some of the early honey flows, but beekeepers were hoping for good later spring and summer flows from wildflowers and bushes. Sources mentioned included sage, buckwheat, eucalyptus and clover. Earlier in the season, beekeepers received honey flows from sources such as orange, various berries, rosemary, borage, blue curls, manzanita, bottle brush, berries, black locust, star thistle and wild mustard. In addition, irrigated fields of safflower, seed alfalfa and cotton should also provide some nice honey flows later this summer.

In Oregon and Washington timely rains helped the moisture situation and bees are now building up well. Earlier in the season, periods of cool, unsettled weather had slowed development. Flows mentioned included assorted wildflowers, various berries, clover, alfalfa and mint. In the mountains of northern California, Oregon and Washington beekeepers are hoping for a good summer flow from fireweed.

A honey shortage still exists in all three of these western states, so both packers and retail honey buyers will be anxious to purchase new crop honey. New crop honey prices are expected to increase due to the heavy demand.

CANADA

Beekeepers in most provinces reported a milder early spring, which has allowed for better overwintering, as well as an early start to important bee work. Although many beekeepers felt the better overwintering was a matter of Mother Nature helping out, others felt that increased use of mite controls, such as the recently approved Apivar (amitraz), helped by keeping varroa mites under control. However, there were still pockets of heavy colony losses in several provinces. One particularly bad winter loss report came from Vancouver Island, British Columbia. Here losses were severe and bees needed to be brought onto the island to recoup bee populations. To do this Vancouver Island officials had end a 25-year-long moratorium on importing bees from much of the rest of Canada.

Imports of bees to the rest of Canada from Australia, New Zealand, Hawaii and Chile have become a routine part of beekeeping for this country's beekeepers. However, this spring two natural calamities delayed some bee shipments. First, the earthquake in Chile delayed bees shipments and when bees did arrive, many were dead. Then, the airborne ash from the volcanic eruption in Iceland delayed bee shipments from Australia and New Zealand for a few days.

Berry and other crop pollination continue to be important money makers for Canadian migratory beekeepers, as it is for U.S. beekeepers. However, declining market prices for blueberries caused some growers in the Maritime provinces to cut back on their planned number of colony rentals this season.

Canadian beekeepers are hoping for better honey crops this season, especially in view of the world shortage of honey and continued strong demand for quality white honey, as is produced in much of Canada. The United States remains the largest market for Canadian honey, so Canadian beekeepers are also concerned about circumvention of U.S. tariffs for Chinese honey, which has caused a two-tiered wholesale honey market—one for legitimate domestic and imported honey and another for cheap illegally imported honey and honey blends.

As in the United States, honey remains very a very popular commodity in the retail market, especially locally produced varieties and brands. The price for both wholesale and retail honeys have followed an upward trend over the last year and this is expected to continue through the 2010 season. Another encouraging sign for Canadian beekeeping is the growing number of hobby beekeepers and the trend toward urban beekeeping by those individuals concerned about nature and the environment.

AUSTRALIA

The Australian agency called Rural Industries Research and Development Corporation (RIRDC) issued an April 2010 report entitled "Estimating the Potential Costs of the Asian Honey Bee Incursion" written by Terry Ryan.

The introduction to the report states: "The current Asian Honey Bee (**AHB**) incursion in Cairns is being managed by Biosecurity Queensland and has involved an investment of over $1 million, from initial detection in May 2007 up to 31 December 2009. One of the crucial issues in developing a response to the Asian Honey Bee incursion in Cairns is determining the appropriate level of industry contributions towards the total cost. The proportion of the costs to be borne by industry can vary between 20 percent and 80 percent, dependent upon the benefit cost analysis. To ensure appropriate proportions of the response are paid, it is necessary to identify the public benefits and costs, as well as industry benefits and costs."

Peter O'Brien, managing director of RIRDC, says in his Foreward, "This report has two key findings of the potential public costs of the Asian Honey Bee incursion. The costs of public health impacts are conservatively estimated to range from $84,114–$88,637 per 100,000 people. The cost estimates for the public nuisance aspects are estimated to range from $4,580–$33,660 per 100,000 people.

"Most of RIRDC's publications are available for viewing, free downloading or purchasing online at **www.rirdc.gov.au**."

Australian Beekeeping Background

Average Australian honey production ranges between 20–30,000 tonnes per year (ABARE 2003). NSW is the largest producer (41%), followed by Victoria (19%), Queensland (15%), South Australia (13%), Western Australia (8%) and Tasmania (4%). The gross value of production is estimated to average around $65 million. Average production per hive was 118 kilograms per hive in 2005.

There are around 9,600 apiarists in Australia operating around 500,000 hives. Over 70% of hives are operated by commercial beekeepers managing more than 200 hives. Most commercial beekeepers are regionally based. Domestic honey consumption is likely to remain relatively elastic with other spreads representing a close substitute as retail prices increase. There is currently a strong demand in the horticultural industry for hive pollination services.

International bulk honey prices peaked at $US1,600 per metric tonne in 2003, but fell dramatically in 2005 to $US800 per metric tonne. Key international honey-producing countries are China, the US and Argentina. Australia is the 9th largest producer (USDA 2005). China and Brazil exports are estimated to increase.

Australia normally imports a relatively small quantity of honey apart from drought years ($12 million in 2004, $38.3 million in 2003 (DFAT 2005). Australian exports average around 8–9 million kilograms per annum. Prices are highly variable, depending on international market conditions.

Future growth of the honeybee industry is dependent on international demand and supply conditions, access to public flora resources and the industry's ability to cope with pests and diseases. Varroa mite is an external honeybee parasite that attacks both the adults and the brood and can kill honeybee colonies. The introduction of varroa mite would have a dramatic impact on domestic production and the industry is reliant on R&D to address this and other potential threats from pests and diseases. Several recent research projects have focused on this. *(Courtesy Australian RIRDC)*

American Bee Journal Editor

C. P. Dadant

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

When George W. York, editor of the *American Bee Journal* from 1892 until his sales announcement in the May 1912 issue,[1] was looking for an opportunity to start a new life in the West, he was faced with the problem of disposing of the *American Bee Journal*. Consequently, his thoughts turned to C. P. Dadant who had been a faithful contributor to the *Journal* for some 40 years.

Although York had contributed to the columns of the *Journal* for a long time, and was the editor and publisher for 20 years, he actually was not a thoroughly experienced beekeeper, being more of a theorist and interested in the development of beekeeping rather than in the actual operation of a beekeeping business.

With C. P. Dadant, it was a different matter. Coming to America in 1863 at the age of 12 with his father, Charles Dadant, he had to take an active role in providing a living for the family. He actually was doing more in agricultural work—until the opportunity arrived.

Soon after the family settled near Hamilton, Illinois, Charles Dadant bought two colonies of bees, and he gradually increased the number of colonies. As time passed, the natural resources of flora caused the colonies to prosper and he found it necessary to call on his son to help with the care of the bees. This was to signal a big change in C. P.'s life.

Camille Pierre (for that is what C. P. stands for) soon became the main operator of the home apiary and gradually expanded to outyards in the search of better locations, moving colonies to harvest honey during the fall flows in the bottom lands along the Mississippi River. These moves were made, of course, with wagons since automobiles were not available yet.

Although his father was writing extensively for American and especially foreign journals, at first, C. P., of necessity, devoted but a small part of his time to writing. It can be assumed that he helped his father in writing for English publications since Charles found the language difficult, and some of the articles are authored by Chas. Dadant & Son.

C. P.'s first contribution to the *American Bee Journal* was entitled "Review of Foreign Bee Journals," and appeared in the May 1872 issue.[2] This was followed by an article in the June 1872 issued entitled "Introducing Queens."[3] Naturally, in these early years he didn't have too much time to devote to anything but bees in order to earn a livelihood. His records show that, as early as 1882, he had extracted 25,000 pounds of honey, which was an enormous crop for anyone at that time. Nevertheless, his contributions to the *Journal* amounted to as many as six in 1885, nine in 1890, eleven in 1896, and these increased, as he had more time to devote to writing, to as many as 32 in 1906. The latter was after he had retired in 1904, leaving the bees and the comb foundation business to his three sons, Louis, Henry and Maurice.

C. P. Dadant purchased the *American Bee Journal* from George York in 1912. He was an editor for 26 years.

Prior to assuming editorship of the *American Bee Journal* in 1912, C. P. Dadant is listed as a contributor upwards of 350 times. A concise reporting isn't made here because some of the volumes were not indexed as to contributors and some articles are listed by Chas. Dadant & Son. His contributions in 1906 marked the beginning of his series entitled "Dadant Method of Honey-Production,"[4] and ran through 21 issues. The article No. 22 entitled "Dadant Methods of Vinegar-Making with Honey" appeared late in the same year.[5]

After assuming the editorship in 1912, C. P. Dadant is listed as a contributor to the *Journal* some 460 times, before his declining health in 1937 and death in 1938. His largest number of contributions occured in 1927 when 46 articles were listed.

We might interject here that, after a busy life and after his sons had entered the business during the period from 1900 to 1910, C. P. Dadant decided he would retire and lead a quiet life. So, in 1904, he built a large brick house in Hamilton and retired.

With C. P., however, the quiet life did not prove entirely satisfying. He found time hung heavy, so he took pleasure in acquiring the *American Bee Journal* in 1912 and moving it to Hamilton.

The *Journal* offices were moved to the floor above the First National Bank in Hamilton. This was quite an undertaking for C. P. and soon he looked around for help. Dr. Miller, as associate editor, answered questions and was of editorial help, but remained at his home in Marengo, Illinois.

As popular as were "Dr. Miller's Answers," C. P. Dadant took over the answer department after Dr. Miller's death and, in addition, he instituted an editorial page that was to run throughout the years of his work as editor.

With his wide range of knowledge in beekeeping, and his long record of writing for publication, as well as his extensive reading in both English and French, C. P. Dadant was an ideal editor and writer for the *Jour-*

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

nal. His subject matter was almost inexhaustible.

He was, of course, a champion of the "large hive," and he also wrote articles on swarm control because there was little swarming in the Dadant apiaries. The production and extracting of honey were frequent subjects, as well as marketing honey, which he had practiced professionally by selling his large crops in St. Louis and other cities.

Races of bees and the rearing of queens were other subjects, for his father, Charles Dadant, had made a trip to Europe to study the Italian race and to import queen bees for breeding stock. Doubtless, C. P., working with his father, played a major part in the rearing and selling of queens.

Prior to his becoming editor of the *American Bee Journal*, he became active in state and national beekeeping organizations. According to Milum's History,[6] he attended the meeting of the International Bee Association at Brantford, Ontario, Dec. 4-6, 1889, and served as secretary of that organization. This group met in Keokuk, Iowa, in 1890, and its name was changed to the North American Beekeepers' Association. During 1891, C. P. helped organize the Illinois State Beekeepers' Association.

At the Washington, D.C. meeting of the North American, Dec. 27-29, 1892, Charles Dadant was elected an honorary member. When the U.S. Beekeepers' Union met Aug. 24-26, 1877, at Buffalo, New York, C. P. was elected one of its directors. This organization then beame the National Beekeepers' Union at a meeting in Philadelphia, Sept. 5-7, 1899, and C. P. Dadant was chosen as one of five vice-presidents. The following year at the Chicago meeting, Aug. 28-30, he was elected to its board of directors and continued until 1901 when the group met Sept. 10-12 in Buffalo, New York.

When the National Beekeepers' Union met in Los Angeles, California, Aug. 18-19, 1903, C. P. Dadant was elected vice-president, and he was re-elected the following year when the National met at St. Louis, Missouri, Sept. 27-30. When the National met in Chicago, Dec. 19-21, 1905, C. P. became president. Following his year as president of the National Beekeepers' Association, and serving as treasurer during 1913, C. P. Dadant turned his attention to his family and the editing and publishing of the *American Bee Journal*.

Previously, we have mentioned that C. P. Dadant was looking for help with the editing and publishing of the *Journal*. There happened to be an Iowa State Inspector of Apiaries who also was a good writer. His name was Frank C. Pellett and, early in 1916, he became Staff Correspondent of the *Journal*.[7] In 1918, Pellett moved to Hamilton and, beginning with the October issue, his name appears as associate editor and M. G. Dadant is listed as business manager.

The need for someone to take care of the Dadant apiaries arose in 1921, and G. H. Cale, Sr. left employment with the U.S. Division of Bee Culture[9] and came to Hamilton to take charge of the bees. Although he contributed many articles to the *Journal*, his name was not listed on the *Journal* staff until the October 1928 issue when both Pellett and Cale were designated associate editors.

Early in the spring of 1925, a decision was made to move the Dadant factory from its old site, 2 1/2 miles north of town, to a three-story brick building located at the foot of Broadway in Hamilton.[10] At this time the offices of the *Journal* were moved to the same location.

In 1932, Frank C. Pellett's status was changed to field editor,[11] and in February 1937 when C. P.'s health was waning, both Pellett and Cale were listed ad editors along with C. P. Dadant. Thus, over the years, C. P. Dadant built a good editorial staff, which with M. G. Dadant as business manager, was quite capable of continuing the *Journal's* publication.

We have not previously mentioned his work on the book by the Rev. L. L. Langstroth entitled "The Hive and the Honey Bee." Langstroth was getting old and, failing in health, he entered into agreement with the Dadants in 1887 to undertake a revision of their own.[12] Thus, in 1889, Chas. Dadant & Son published their first revision of the book. There followed a number of printings and one revision, by C. P. Dadant, in 1907, known as the 20th Century edition. All were copywrited by Chas. Dadant & Sons 1888, but the 1919 printing addeed "Copywrited 1919 by C. P. Dadant."

After the death of Charles Dadant in 1902, C. P. continued its publication with an extensive revision in 1922, designated as the "Twenty-First Edition." The last printing published by him was called the "Twenty-


AMERICAN BEE JOURNAL

MAY 1912

THE LARGEST ELECTRIC POWER DAM IN THE WORLD, NOW BEING BUILT ACROSS THE MISSISSIPPI RIVER, AT THE NEW HOME OF THE AMERICAN BEE JOURNAL, AT HAMILTON, ILLINOIS—DAM BEING OVER HALF MILE LONG.

This view was taken April 4, 1912, from the outer edge of the cofferdam, on the Iowa side, 1000 feet from the Iowa shore, looking across towards the Illinois shore. The city of Hamilton is at the extreme right. There are to be 119 arches, 83 of which now show in the picture. The power-house, lock and dry dock are now being built on the Iowa shore. The immense power will be generated by 30 turbines of 10,000 horse-power each. The fall, caused by the Des Moines Rapids to be flooded, is from 30 to 36 feet, according to the stage of water. The cities of Keokuk and Hamilton, on either side of the big river, have become centers of activity, and have a bright future. A view of the entire works, taken from the Iowa bluffs, will be published later in the American Bee Journal.

This immense undertaking, which is to cost over $[illegible], was planned, and is now being carried out, by Hugh L. Cooper, probably the most capable hydraulic engineer living.

This is the cover of the May 1912 *ABJ*—The first issue published by C. P. Dadant & Dadant & Sons, Inc. At the time the Mississippi river power dam & lock were being built between Keokuk, IA and Hamilton, IL. C. P. Dadant and several other Hamilton and Keokuk community leaders campaigned heavily for construction of the lock and dam.

Third Edition" and was brought out in 1927. During the course of three years, the book was translated into French, Spanish, Russian, Italian and Polish languages.

In the meantime, "First Lessons in Beekeeping," a beginners' book that had first been published by former editors, Newman and York, needed revision. So, in 1917, C. P. Dadant extensively revised and rewrote the book which was published in that year. This book has gone through numerous printings and, in 1938, was revised by M. G. Dadant and J. C. Dadant and is still published today. The most recent edition in 2007 was authored by Dr. Keith Delaplane. Past editions have been translated into Spanish, French and Russian languages.

At the time that C. P.'s first series of articles appeared in the *Journal* entitled the "Dadant Method of Honey-Production," there came a demand for this in book form. Subsequently, in 1920, the "Dadant System of Beekeeping" was published. This also was followed by translations into the French, Spanish, Russian and Italian languages.

"First Lessons in Beekeeping" and "Dadant System of Beekeeping" have been widely sold, and the first one is still published. C. P. also authored two lesser publications: "Apicultura" published by the Mexican Government, and "Bee Primer," a booklet for beginners.

His last important literary accomplishment was his translation from the French of Huber's "New Observations Upon Bees," originally published in 1814. Dissatisfied with the translations of others, he took it upon himself to do this. The book was published in 1926, and this was his last literary effort.

C. P. Dadant's name appeared on the masthead of the *American Bee Journal* for almost 26 years, a longer span of years than any previous editor until that time. He died Feb. 25, 1938 at the age of 86.[13]

C. P. Dadant brought to the *American Bee Journal* a background of experience and knowledge unsurpassed by any previous editor. His life in America began as a 12-year-old boy selling blackberries and farm produce in the neighboring town of Keokuk, Iowa. He took to beekeeping when his father needed help, built up the apiaries and made a life-long success of beekeeping and the manufacturing of beekeepers' supplies. In retirement, he took on the task of editing and publishing the *American Bee Journal*. By his own Herculean efforts, he raised himself to become one of the most popular and well-known beekeepers and editors throughout the entire world.

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"I want the *American Bee Journal* to be the finest publication about bees and beekeeping in the world."—C. P. Dadant, 1912

So said C. P. Dadant when he became editor in 1912. Those who worked with C. P. Dadant through the years became imbued with his spirit as he guided their thoughts and efforts. He was a scholar loved all over the world. His desire for ABJ, handed to us when he passed on, remains the goal towards which we are constantly striving at Dadant & Sons, Inc.

1916 1923 1929

Above are some of the covers of *ABJ* through the years. These issues were done during C. P. Dadant's editorship.

Honey Bee Biology

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Remembering the 99 Bee Periodicals that Perished and the Miracle of the *American Bee Journal*

The *American Bee Journal* has reached its 150th anniversary, a publication milestone, a miracle that started in 1861. One way to better appreciate this feat is to see it in the big historical picture of all the bee-related journals begun in the United States. This perspective, rarely explored, is quite revealing.

Many of these periodicals began in response to the initial formation of the beekeeping industry in the late 1800's and into the early part of the 1900's. Periodicals were a way for beginners to learn some basic beekeeping, and for all, even those with much experience, to keep up with current events, and disseminate new ideas. These were times when fundamental aspects of apiculture were being worked out, mostly without scientific methods that would bring more efficient techniques later. For example, various devices were offered for sale, often with poor testing beforehand. Do swarm-catchers that fit over the hive entrance really work? If they did, I dare say today they would grace hive entrances from coast to coast. And the limits of how much one could manipulate the bees were also encountered. Can queen bees be mated in a screen cage, that is, can queens be mated in captivity? Some beekeepers mistakenly claimed they could.

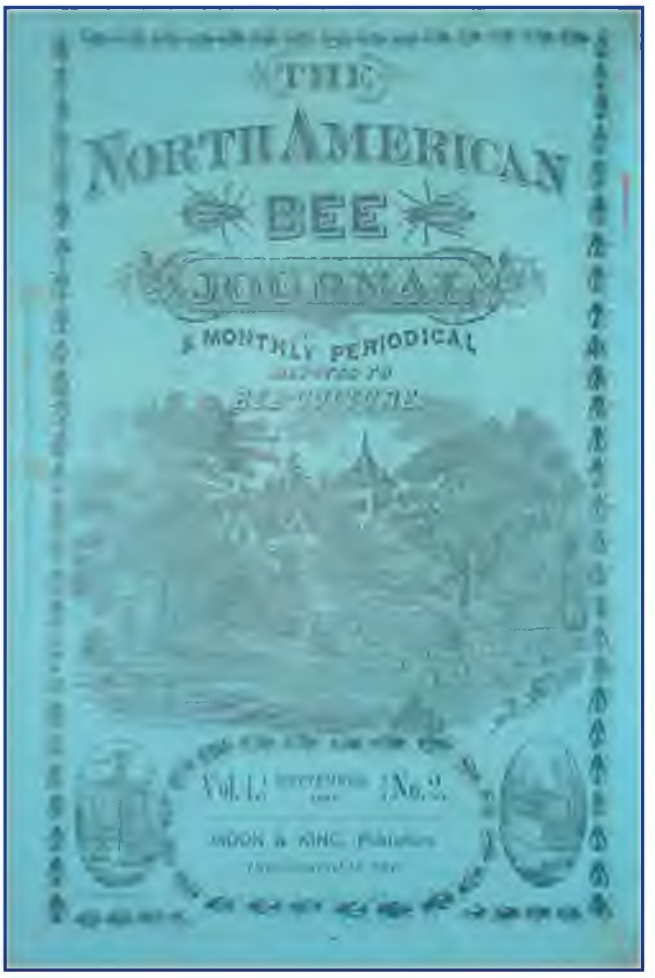
Monthly beekeeping journals tended to tie these collective discussions together. For progressive beekeepers living isolated on rural farms, where long-distance travel to meetings was terribly limited, when addresses were only a name, town, county, and state, a bee journal's arrival must have been an intellectual breath of fresh air. A beekeeper-writer could see his or her ideas, either on management techniques or a newly devised piece of equipment, published before a community of readers. To some extent the periodicals were their version of the Internet for a loyal following of readers.

Nevertheless, the birth of a beekeeping periodical did not ensure its survival – oh far from it. A. I. Root started what we know today as *Bee Culture*. He wrote about the early days of publishing his brainchild, originally known as *Novice's Gleanings in Bee Culture*, giving us a rare first-hand account of some of the initial logistical difficulties in starting a bee journal. (Novice was Root's pen name. The "Novice" part was dropped after the journal's first year in 1873. The name took its current form in 1993.) The first year was printed at the local newspaper in Medina, Ohio. For the second year, Root had his own foot-powered printing press. To ease the workload he hooked it up to his windmill, another of his fascinations besides bees. Root was quite pleased to see his two hobbies working together. The wind proved quite variable though and occasionally the copy came out crooked on the page. Root asked forgiveness from his readers, and they seemed to take it in good stride. Before the third year ended, he had a steam engine to supplement the foot power[1]. In my master collection, the year 1874 does have a few pages with crooked copy, now seen as heroic testament to Root's will to get out those early issues.

The first few years of a bee journal's life with the workload falling on one dedicated person, or perhaps just a few people, would be a fragile time to maintain publication deadlines. A low starting circulation, too few advertisements and mounting expenses could doom a fledgling bee paper to a quick demise. While the *American Bee Journal* and *Bee Culture* are well known by today's beekeepers, far less appreciated is an obscure historical fact with important ramifications.

A total of 99 other periodicals related to bees were started in the United States (and ten in Canada). A nine-page list of them, including short descriptions, appears in an unlikely place, the *Report of the State Apiarist of Iowa for 1930*, now a remote dusty corner of the beekeeping literature. Most of these publications led brief lives. They surely indicate long life for a bee journal was quite unusual. Overall, a survival rate of less than 2%. A mere two ticks from certain death. On the other hand, so many start-ups suggest a fledgling industry grappling with how to meet its demand for beekeeping information.

Consider the heart wrenching yet quietly heroic story behind *The Beekeepers Review* launched in 1888 by W. Z. Hutchinson, a well-known comb-honey producer from Flint, Michigan. The *Review* was well received with informative articles. From the fifty or so issues I have managed to collect (far from a complete set), Hutchinson's long-standing style was to inform the readers of publication difficulties. So when his health weakened and finances tightened, requiring him to give up the rented space in town, and while watching a sick child and publishing the *Review* essentially from the living room of his home, the readers knew it was a true family effort. Hutchinson also had a terrible burden of family hardships to endure, threatening to unravel the *Review*,



(l) Figure 1. The issue of *The Beekeepers Review* announcing the passing of its creator and champion, W. Z. Hutchinson. The standard cover picture of the *Review* was a comb honey section box framed by its main nectar source basswood in bloom. Breaking that tradition on this solemn occasion is the little inset photograph of Hutchinson. (r) Figure 2. *The North American Bee Journal* for September 1872. The artwork, now like rare art, is quite beautiful and would be compelling to a beekeeper of the 1870's. The large prosperous house is associated with a well-kept apiary, suggesting security for both bees and the keeper could be found on the pages within.

his main source of income.

Apparently, it was fairly well known in beekeeping circles that Mrs. Hutchinson was not well. An editorial in the *American Beekeeper*, a periodical published in Jamestown, New York, reported in September 1897, "As has been generally known Mrs. Hutchinson has, for some time been in ill health, both mentally and physically …." While that was common knowledge, what was coming sure shocked them and me too. As an apicultural historian, I have known and read about Hutchinson since I was a teenager. He wrote *Advanced Bee Culture*, a well-known book among bee-book collectors. Only a few months ago did I find the article telling the tragedy, written bravely and eloquently by Hutchinson himself, possibly to prepare his readers in case upcoming issues were late.

Hutchinson had two daughters named Fern and Ivy. I found an article cut out of the *Review* (so the date is missing, but I am guessing it was from around 1897). The title is " The Sad Death of Sweet Little Fern." At the time, as best as I can tell, Fern was about five years old and Ivy was a few years older. Mrs. Hutchinson had been ill for the past two years and in an asylum for the past winter. She had become so home-sick that Hutchinson and the doctors thought a more rapid recovery would happen at home. All seemed to be going well during the summer. When Hutchinson returned from a beekeeping convention, he found her in an agitated state thinking the entire family would eventually go insane. He talked with her late into the night trying to reassure her and thought he succeeded, but he was still deeply worried. Hutchinson either had to give up the conventions or "fairs," presumably to promote the *Review*, return her to the asylum while he was away, or take her with him. He decided to take her on the trip, which was the next day, hoping the trip would help her. She agreed to go. Apparently that quick agreement was unusual. The next day Hutchinson went to get a lady to stay with the girls. He even saw his wife and little Fern driving in town on one of their normal outings and spoke to them. Fern wanted to get some candy. Hutchinson would never see her alive again.

At the drug store, his wife bought a bottle of chloroform, drove Fern to the city limits, and poured the toxic fluid in a handkerchief. Then the mother forced the deadly rag over the child's face "until life was extinct." She hid poor little Fern's body under the bushes and drove back for Ivy. Upon returning to the outskirts of town with Ivy, the mother pulled out a pistol and shot Ivy three times: in the chest, the lower back and in the face, the last bullet knocking out two teeth and passing through the tongue and into the back of her throat. The gunshots and Ivy's screams attracted the quick response of an unknown stranger who ran up and grabbed the gun away. Remarkably, Ivy survived the horrific ordeal (though from later passing comments in Hutchinson's articles, physically she would not completely recover).

Even through these terrible difficulties, and for years after caring for his family, Hutchinson managed to keep the *Review* strong until 1911. The June and July issues, arriving combined, announced the sad news, the passing of its editor from a

(l) Figure 3. *The Bee-Keepers Advance* and *Poultrymen's Journal* for November 1888. Bees from a traditional skep and a hen and a rooster share the banner. The Dadant's even have an advertisement for foundation in the issue. (r) Figure 4. *The Beekeepers Magazine* for December 1879. This one is very utilitarian with the contents right on the cover.

chronic illness (see Figure 1). Others tried to keep the *Review* going, though no sound long-term replacement editor could be found[2]. Eventually publication ceased. With the passing of the *Review,* we are reminded of an important lesson.

The initial success of a bee journal, difficult as that may be, is not nearly enough. A bee journal must live past its creator, become sustainable, and gain a sense of immortality. For long-term life, a bee journal needs a reliable way of being handed down from one beekeeping generation to the next. If successful, it becomes a collective contribution of many beekeeping generations. And in its longest bloom, a bee journal becomes an unbroken historical record. Hardly any have endured though the sprouts were many. Here is a small sampling of the ones that perished.

The North American Bee Journal, a periodical with a name similar to the *American Bee Journal*, had just a flickering of a brief life. This now hardly heard of journal saw publication from only August 1872 to July 1873 with two issues lacking. So only ten numbers were ever issued (according to the Iowa Report). Figure 2 shows volume one number two, which would be the second one issued. It is among the rarest gems in my journal collection.

In the northeast, *The Bee-Keepers Advance and Poultrymen's Journal* was published in Mechanic Falls, Maine (see Figure 3). It began as *The Bee-Keepers Advance* in 1887. Poultry, another small-farm endeavor besides beekeeping, was added in the second year, presumably to help boost circulation and advertising. As an independent journal, *The Advance* did not last long. Beginning in 1889 came a series of buyouts and mergers with other journals. By about 1890 it was gone. *The Beekeepers Magazine* was published from New York (see Figure 4). It ran from January 1872 to December 1888 and then was absorbed by the *Beekeepers' Advance*. Mergers and buyouts were common among fledgling bee journals struggling to survive.

The Bee-keepers Journal and National Agriculturist for the Apiary Farm and Fireside, was a paper titled for a different time (see Figure 5). Laborious farm work by day was balanced in the evening by fireplace warmth, conversation, and reading. Flame provided all the light. Electricity – not even a dream. That was the utilitarian theme of this paper. Published in newspaper format, at least for 1870 and 1871 (for the only two copies I have), most likely that increased its rarity given the ephemeral nature of newsprint (and its closeness to the fireplace on a cold morning.). Little is known about this periodical, except that decades of collecting and writing for this article have all lined up perfectly to make truth stranger than fiction. The beekeeper, pictured on the front page in Figure 5, the precise issue saved from the fire pit and preserved safely for 140 years, an image almost never seen in the bee literature, just happens to be the unsung Good Samaritan who saved the *American Bee Journal* while in its infancy.

Samuel Wagner, a bank cashier, started the *American Bee Journal* in January 1861 from Philadelphia, Pennsylvania. After the first year, the Civil War caused its suspension; it resumed in July 1866. By 1871, *The American Bee Journal* came to the edge of bankruptcy. The death list of bee journals could have been an even 100. That was not to be. A campaign by one beekeeper, Elisha Gallup, boosted subscriptions back to its salvation[2], and showed what a positive difference, and a crucial contribution, one beekeeper can make. He is the beekeeper shown in Figure 5. (G. M. Doolittle au-

Figure 5. *The Bee-keepers Journal and National Agriculturist for the Apiary Farm and Fireside* for August 1870. Almost no one knows the beekeeper featured so prominently on the front page. His name may have faded far into obscurity, but I assure you his good deeds in beekeeping live on to this exact moment. To see how – read on.

thored *Scientific Queen Rearing*, a profound text formulating modern queen production that spread worldwide. He had a mentor and teacher – Elisha Gallup. So make that at least two "Hoorahs!" for Gallup.)

After the death of Wagner in 1872, the ownership of the *American Bee Journal* changed hands a few times, which usually required a change in editor and location (moving to Washington, D.C. then to Chicago, Illinois). In 1912 the Dadant and Sons Company acquired the *American Bee Journal* with C. P. Dadant as editor. In addition to manufacturing beekeeping equipment, the Dadants had already been involved in apicultural publishing. Since 1885 they had been working to revise Langstroth's book, *Langstroth on the Hive and the Honey-Bee*, when the author's health had declined and after his death in 1895. Those were days of extensive advances in beekeeping requiring numerous changes to keep the book current. In 1889, the Dadants first published the extensively revised text (and continue publishing revisions today).

Prophetically, back in 1872, Charles Dadant, father of C. P. Dadant, had been offered editorship of the *American Bee Journal* after Wagner's death. Charles had declined. Upon coming to America from France in 1863, Charles had taught himself English by reading newspapers in the evening, after the farm work, with the help of a pocket dictionary. He had become an accomplished English writer, submitting articles to bee journals and had acquired a respected reputation among beekeepers. He was also known internationally by writing for French and European bee journals on the merits of Langstroth's movable frame, enlightening the Old World on the new beekeeping[3].

The *American Bee Journal* survived its fragile times, when virtually all others failed. At one point it almost joined them, were it not for just one energetic beekeeper. From eastern roots, the nomadic *American Bee Journal* headed west, following the path of new opportunities in a growing country. Eventually, it settled in Hamilton, Illinois, the location of the Dadant and Sons Company. There the *American Bee Journal* found a stable home to grow and flourish. To become the journal we know today.

Seen from the fall of the 99 other bee journals and from the brink of its own near death experience, the *American Bee Journal* is a miracle arriving to us every month.

Acknowledgments

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

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Migratory Beekeeping

From the "History of American Beekeeping"

by FRANK C. PELLETT*

In 1878, C. O. Perrine, of Chicago, a dealer in honey, conceived the idea of a floating apiary on the Mississippi River. He thought that by moving the bees north as spring advanced, it would be possible to extend the season and keep the bees busy for a much longer period.

He, accordingly, purchased a steamboat in Louisiana and started north in early spring. About $15,000 were invested in the outfit, including steamboat, barges and bees with their equipment. A crew of fifteen or more men was required to manage the boat and care for the bees.

The outfit was described in the *American Bee Journal* as follows:

> The hives stand in four walls, five hives one above the other, nearly the whole length of the boat, about 250 hives in each line.
>
> The walls of colonies on the right side and left side have openings for the bees to come out on the water front; a space of two feet between the hives and the guards answers for a gallery for the beeman to walk on in front of the hives.
>
> In the middle of the boat there are two other walls of colonies, 250 hives in each, facing an inner court six feet in width. The bees from these colonies reach the open air through the sky line opening in the roof above the court.
>
> Between the first and second rows of hives from the outside there is an aisle three feet in width, for the convenience of handling the hives and the honey.
>
> The distance from the barge deck to the roof over the colonies is 15 feet. The space below the deck is 10 feet in width and about 7 feet *high*. and is to be used for sleeping apartments, making and repairing hives, handling and extracting honey and putting it in marketable shape. The dining room and cooking will be on the steamer that tows the bee fleet.

Perrine planned to harvest big crops with his fleet of barges which were to carry from 1,000 to 2,000 colonies of bees. He had visions of shipping the honey direct to Europe, as he was exporting extensively at that time.

The start was made with 1.000 colonies arranged as above described. The intention was to reach St. Paul, Minnesota, a distance of about 2,000 miles, by the end of July. Apparently, no one connected with the enterprise had any clear idea of nectar sources and honeyflows, since the thought was expressed that so many bees would harvest the cream of available honey in any location in one or two days. Instead of remaining stationary when a good flow was on, the outfit kept on moving and thus missed the best of the possible crop.

Starting from New Orleans on May 14, the steamer had proceeded only sixty miles upstream when an accident required the owner to return to the city for repairs, leaving the boat tied up to the bank. So many delays occurred through accidents and breakage of machinery, that the progress north was very slow. Finally, the barges were abandoned and the bees placed aboard the steamer itself. Every few days the boat would stop and set the hives on shore to permit the bees to gather the available harvest, then they were reloaded and the movement north resumed. Although it appears to have been late in summer before the boat reached St. Louis, it was announced that the journey would be completed through to St. Paul and then the bees moved south again for the winter. Perrine proposed to start north again the following spring with 2,000 colonies, leaving New Orleans not later than April first.

Perrine returned to Chicago in October, leaving the remaining 600 colonies of bees near the bank of the river in Calhoun County, Illinois. There he expected to leave them until November, or until the yellow fever had subsided, when he expected to move them down the river again.

Perrine's attempt appears to have aroused an immense amount of interest, and at least one other beekeeper attempted to follow his example. W. B. Rush left New Orleans with

The truck replaced the slower wagon for moving bees as soon as it came into common use.

*Former editor of the *American Bee Journal* and author of the book *History of American Beekeeping*.

How one California queen-breeder moved his outfit to a new location. Photo taken circa 1915.

a small boat and sixty-one hives of bees for a similar trip north. He went as far north as Pekin, on the Illinois River.

At the winter meeting of the Eastern Iowa and Western Illinois Beekeepers' Association, Perrine spoke of his experiment and stated that heavy losses of bees occurred from falling into the water, as much as 25 per cent, he estimated. He proposed to try again the following season, moving the bees only at night. The result, as would be expected, was disappointing and the following year he told of his failure at the convention of the North American Association. There he stated that, after several attempts to establish a floating apiary, he would advise the beemen to keep as far as possible from large bodies of water. He had lost most of his working force of bees in two days when they fell into the water during a cold wind.

Perrine was not entirely persuaded that migratory beekeeping could not be made to succeed, but he proposed in the future to move the bees by rail.

Little was heard about migratory beekeeping for several years after Perrine's disastrous experience. In the late 1880's, O. O. Poppleton, a successful Iowa beekeeper, began spending his winters in Florida because of poor health. Finding that the mild climate was conducive to improved physical condition, Poppleton moved to Florida and settled on the Indian River. He adopted the "Long Idea" hive which held 25 frames which were 12 inches square. No supers were used, and filled frames were removed from the hive body itself when ready for extracting.

Poppleton argued that such a hive was never top-heavy and could not be blown over by heavy wind, and that there were no heavy filled supers to be lifted.

He found the river an ideal place for him, as by means of a gasoline launch he was able to move his bees from place to place in search of pasture. Up and down the river there were a variety of plants which came into bloom at different times. When conditions were unfavorable in one locality, he sought pasture elsewhere. At times he had

For transporting bees in swampy areas of Florida, there is nothing better than the launch. Photo taken circa 1915.

O. O. Poppleton was a migratory beekeeper along the Indian River in Florida for many years.

bees in locations a hundred miles or more apart.

Poppleton thus was the first successful eastern migratory beekeeper who became well known to the readers of the bee magazines. He continued his operations in Florida for many years and harvested some large crops of honey from palmetto and other southern plants. With no permanent locations at an time, he could load an apiary on his boat and move it to a new site.

A few years later W. J. Stahmann, of Wisconsin, was advised that a change of climate would be necessary for his wife, who was in poor health. He was a successful beekeeper and had no intention of abandoning his bees. He. accordingly. bought a cabin boat and a large barge and took both his family and his bees to the river. The first summer was spent on the St. Croix River with a fortunate location selected for the bees. A crop of 45,000 pounds of honey was harvested, and Mrs. Stahmann began to improve in health. After the crop was sold, he started down the Mississippi. When the mouth of the White River was reached, they moved up that stream in search of another suitable location. The following summer was spent on the White River, with a smaller crop harvested which was of poor quality. Expenses were high, and the venture was losing money. When it became apparent that the river venture could not succeed, it was abandoned and Stahmann moved to Clint, Texas, where he became very successful as a honey producer and large-scale farmer.

J. S. Harbison, of California, was probably the first to call attention to the possibility of successful migrations by means of the railroad. In 1876, when the crop was exhausted in the home location, he loaded his bees on the cars and moved them 60 miles into the foothills of the Sierra Nevada

This light pleasure car was converted to carry hives and honey and has become indispensable in Miss Mathilda Candler's small outapiary system. Courtesy of Miss Mathilda Candler of Wisconsin, circa 1910.

Migratory Graham of California at one time had 3,000 colonies of bees in the early 1900's. He moved them by rail and then by horse and wagon to specific honey flow locations.

Mountains where the manzanita and buckeye were in bloom. Later he moved again to Truckee for later blooms, returning to his home location for the winter.

Later, another Californian was to become famous because of his frequent movement of bees in carlots. He became known as Migratory Graham, and boasted that he had kept bees in 32 California counties and five valleys in Nevada. According to his own statement in 1918, he had shipped 161 cars of bees.

A typical season with him was to start the bees in the almond belt of Butte or Colusa Counties. From there he would move to orange in Tulare County and then back to the Sacramento or San Joachim Valley to the seed belt. From there he would go north to alfalfa and south again for jackass clover.

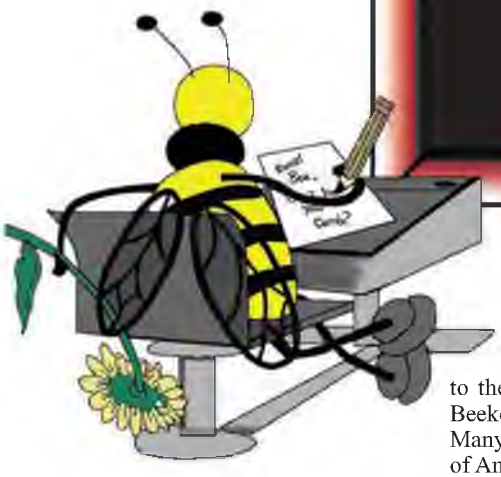
Graham had more ups and downs than usually fall to the lot of the man who aspires to do things on a big scale. At one time he had 3,000 colonies of bees and the best equipment on the Pacific Coast, and produced a crop of 120 tons in one season. Bee disease resulted in serious complications for him and he was frequently in difficulties because of the disease laws.

The high cost of preparation, the long haul by freight and loading and unloading, and moving to apiary sites with horses and wagons resulted in too much expense to make migratory beekeeping by rail a practical method. The auto changed all this. It was the automobile which made migratory beekeeping really practical. With the perfection of this machine, it became possible to load an outfit, move it a long distance, and set it down in the new location within a few hours. Migratory beekeeping became common practice, especially in California, where large areas are devoted to the production of some special crop.

Many western beemen began following Graham's example and moved three or more times in a season. Harvesting of two or more crops from the same outfit in widely separated localities became the usual and expected procedure in many places.

The Classroom
by Jerry Hayes

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



Boy Scouts and the Beekeeping Merit Badge

In the April Classroom I alerted you to the efforts being made to reinstate the Beekeeping merit badge in the Boy Scouts. Many of you sent letters to the Boy Scouts of America (BSA) in support of reinstating the Beekeeping Merit Badge. I even received a letter (see letter) from Mr. Robert Mazzuca, the chief scout executive, in response to the "Classroom" call to action a couple months ago—pretty wishy-washy, but a response nonetheless.

Many of you have told me that you received replies also. Some of you have been told by the BSA that the Beekeeping Merit Badge was "too hard" to obtain.

As of April 28th the BSA has offered new merit badges for Cub Scout Webelos for VIDEO GAMES! They can get pins and belt loops for video games! Give me a break! What a sad commentary on where we are as a society. The Scouts have strayed from the original intent of the program. Lord Baden Powell is spinning in his grave. We need more opportunities to raise boys to be real men. Maybe I am just getting too old, but I don't think awards for video games is it.

100 YEARS OF SCOUTING

Robert J. Mazzuca
Chief Scout Executive

April 23, 2010

The Classroom
c/o Jerry Hayes
17505 NW Highway 335
Williston, FL 32696

Dear Jerry:

I enjoyed reading the letters in the April issue of *The American Bee Journal*. I was especially pleased to read how Dennis of Bryan, Texas, developed his love for beekeeping as a result of working on the merit badge. We have received a considerable amount of communication about reinstating this merit badge, and we appreciate everyone who has contacted us to weigh in on the subject.

The Boy Scouts of America evaluates the offerings available through the merit badge program on a regular basis—whether to begin a new one or reinstate an older one. There are 122 merit badges available at this time. In order for a merit badge to remain in the program, a minimum number of boys must complete the award every year. This requirement is an effort to keep the program in alignment with the interests of today's youth members.

The process to evaluate reinstating the Beekeeping merit badge has already begun. The next step involves a review by youth members, and their input is expected by July. When youth voice a high interest in a merit badge, it proceeds to a team of adult volunteers for review and approval. Upon approval, writers of the merit badge series seek subject matter experts such as your readers to help develop the pamphlets.

We recognize that beekeepers have suffered from the ravages of colony collapse disorder and also see that many more Americans recognize the critical need of honey bees for the production of honey and for the pollination of crops. Perhaps there will be enough interest from our current youth members to reinstate a new and improved Beekeeping merit badge. If research shows that there is sufficient interest, I hope I can count on each of you to help teach the next generation of American beekeepers.

Sincerely,

Robert J. Mazzuca
Chief Scout Executive

/cb

BSA 2010
BOY SCOUTS OF AMERICA
1325 West Walnut Hill Lane
P.O. Box 152079, Irving, Texas 75015-2079
972-580-2000

West Virginia Beekeepers

Back in late spring of this year I had the distinct honor and opportunity to participate in the West Virginia Beekeepers' Association spring meeting. I had worked previously with Wade Stiltner and Paul Poling in the West Virginia Dept. of Agriculture on some joint apiculture training a few years back. The Heartland Apicultural Society (HAS) held their meeting a few summers back in Huntington, WV and life intervened to prevent me from being able to attend that meeting. So, when I was invited to come to the WVBA spring meeting, I jumped at the chance. Other than the good people I already knew in beekeeping from West Virginia, I really didn't know that much about WV beekeeping or West Virginia in general.

The meeting was held at a very cool place outside of Huntington called the Heritage Farm and Museum, **www.heritagefarmmuseum.com**. A tremendous amount of time, energy and resources have been given by the Perry family, who have championed this project to give the rest of us a glimpse of WV History through the farm

and museums. It is really a great place for a beekeepers' meeting and a terrific getaway. Dan O'Hanlon, Gabe and Rhonna Blatt and a whole host of other active and engaged WV Beekeepers made this a smooth, enjoyable and information-filled meeting. There were a number of great talks and training sessions, not the least being Dr. Larry Connor conducting his well-known Queen Rearing Workshops.

Attendance records were broken with 207 attendees from West Virginia, as well as Ohio, Kentucky, Virginia and Florida. I am flatlander from Florida, so the mountains, hills, ridges, hollows, hardwood trees and fast flowing mountain rivers were very, very beautiful.

There is a push for more internal queen production by the WVBA, so that is the reason the association sponsored Dr. Larry Connor's Queen Rearing Course. With the opportunity to access remote locations in the state that allows control over drone distribution, West Virginia has a large advantage to significantly and positively add to queen production—queens that will be hardy, reliable and lead big healthy colonies.

Keep an eye on West Virginia. They are quietly moving their beekeeping, queen production and specialty honey production forward strongly. I wouldn't be surprised if we were looking to WV queen breeders in a few years to purchase queens.

Q Washington Requeening

Hi Jerry. I am one of your loyal readers out in Western Washington. I am wondering if you have an opinion whether annually requeening is a good hedge against queen-related problems or is more expense and effort than it is worth? I keep fewer than five hives, depending on winter survival.

If it is a worthwhile endeavor, is it best to do in spring, fall, or some other time? And, what other considerations or recommendations are there for a successful requeening regimen? Thanks for all you do for the beekeeping community.

A

The first question that comes to mind is: What challenges are you experiencing that are causing you to consider this? Are the queens you have purchased less of what you want the second year than the first? Do they lay less? Do you have less worker brood? Do you have more drones? Are you having more swarming the second year?

The quality of commercially produced queens has not been very good the last few years. We have seen lots of "supersedures". The colony is not recognizing the queen as a queen and replacing her—then replacing the replacement. Data shows even in the best circumstances, queens do not last very long, but this is even worse than that.

We, the industry, have been taught that spring requeening is the best. It certainly is easier with lower colony populations. But, probably the best time to requeen for successful overwintering is to do so in late summer or early fall after mite treatments have been completed. You have a new queen that can contribute lots of young "winter bees" and is ready to go in the spring for quick build up with no delays or breaks in the brood cycle that can occur with spring queen replacement. Give it a try.

Q Can I Feed Raw Sugar to Bees?

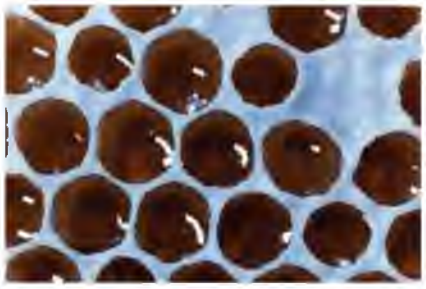
Dennis from Lonestar Farms referred this question to you; it may be a little early, but I can start planning now. I raise ribbon cane and some sorghum and I usually make some syrup and sugar in the fall. I am new to beekeeping, but I was wondering if the raw sugar I make in the fall would be okay to mix with water to make the sugar syrup for fall feeding?

Thanks,
Wayne

A

Honey bees in Florida are at an advantage in that they can get outside and fly most of the year and are generally not restricted by weeks of cold weather as they are in parts of the northern tier of states. The reason I mention this is that dark sugars many times have extraneous material in them that make them dark—kind of like roughage in our diets. Anything that is not digestible in a honey bee's gut has to be voided at some time. Honey bees generally try very hard to "hold it" until they can get outside to void. If they can get out regularly, that is a good thing. If they have to "hold it" for weeks or months because of cold or wet weather, then this can cause other problems like dysentery from the *Nosema* microsporidian. So, all that said, feeding honey bees a supplemental/substitute diet of anything that is not clean and pure can in the long term be counterproductive. Remember, nutritional recommendations for bees are not the same as for humans.

Q UNCAPPED = NOT READY



I am a hobby beekeeper who is on the road to commercial beekeeping.

I was wondering how important it is to extract capped honey versus uncapped honey? What is the difference between the two?

Vadim Manzhos
Southern California

A

Unless you are a commercial beekeeper with the proper large-scale honey house equipment available to dehydrate your high moisture honey, don't extract uncapped honey. Some northern commercial beekeepers do this on a routine basis, but they know what they are doing and have the process down to a science.

Winter is a difficult season for most creatures, but probably more so for a social insect that maintains a large population in a climate with harsh temperatures and no food available from flowering plants. The short story is that this social insect figured out how to take high moisture calorie-rich flower nectar and remove some of the moisture so that in combination with other factors, the honey could be stored successfully without rotting/decomposing for a very long time or at least until spring and the next flower bloom.

Dehydrate high moisture nectar down to 18% moisture or less, seal it in its own container (cell) and you may survive with your queen because you have a consistent reliable food source. Uncapped cells are a hint that the preservation process of the nectar change to honey is incomplete. If it is not complete, then the moisture content of the nectar is high enough to support the growth of organisms such as bacteria, yeasts, molds and combinations of all three. These organisms will use this food to grow and reproduce. Beekeepers can certainly harvest large quantities of uncapped high moisture honey. But left as it is, there is the strong risk that the product will start to ferment and decompose.

Since millions of years ago honey bees discovered how to preserve high moisture, high sugar nectar, I think it is smart to pay attention to them—what they do, why they do it and not try to re-invent the wheel. They are infinitely smarter than we are in this way.

Q Grumpy Bees

I have a question about my black bees. They are aggressive and agitated most always. This hive used to be Italian a few years back and must have mated with a wild honey bee of some type. I tried to requeen from my Italian hive this week (a new emerging queen). I guess they did not like the pure breed, as I cannot find her on the six strong combs. Last year these bees were poor performers, so I killed their dark queen. They rejected an Italian last year also. Looks like I may have to get a new queen. Any ideas on what kind of queen might be accepted in this hive?

Thank you,
Brent Taylor

A

Brent, I trust that you have double-checked to make sure this grumpy colony does not already have a newly raised queen or laying workers? Also, are you using introduction cages to introduce your new queens? Without the proper introduction period, the queen would be killed immediately, unless you are in the middle of an intense nectar flow. Sometimes it helps to even prolong the caged time in the hive by as much as a week before taking out the cork over the candy end of the cage. This gives the queen more time to pick up the scent of the rest of the hive. You might also try giving the queenless colony a frame of queen cells from one of your strong colonies preparing to swarm. This grumpy colony would be more likely to accept the emerging queen, unless it already has a queen.

If you are in an Africanized honey bee (AHB) area, this all makes a lot of sense. Defensiveness, aggressiveness and inability to requeen are all traits of AHB. You don't have to be in the front line of the advancement of AHB. If you or somebody around you is purchasing queens or packages from AHB areas, these may carry African genes and, of course, they produce drones, which can mate with virgin queens from colonies that are replacing queens because of swarming and/or supersedure. AHB-influenced full size colonies are very hard to requeen. You can break the full size colony down into 2, 3 or 4 nucs and it seems to calm them down so that they will accept queens of different strains. AHB queen pheromones are slightly different and reducing the volume/strength of them helps in requeening.

All that said, why don't you just pretend that you have some kind of funky genetic influence and break the colony in two to see if that helps in requeening. It might make this colony more productive and more fun to open up without having it be agitated all the time.

Q Herbicides and Bees

My friend has several hives on the outskirts of an orchard. He checked with the manufacturing company. They said that Roundup® would not hurt the bees. What is your opinion on this? Look forward to your response. Thank You.

A

The short answer is that the label for glysophate indicates that it does not harm honey bees acutely. That is probably true. However, I would be sure that with any application you are careful not to spray the bees or hives directly and not spray any blooming plants that honey bees might visit before the plants die. Even if Roundup® does not kill bees, you certainly do not want this herbicide in your hive, honey, and other hive products.

Q Cleaning Old Frames

A few queries:

A. I have some old plastic frames which have imprints of cells, but when I originally purchased them, they had a light beeswax coating to stimulate comb construction. They are now old, the comb is dark, fragile, and last year had a bit of wax moth workings. I dug out the moths and their tunneling. Is it worthwhile for me to scrape away all the old comb, then paint on fresh wax and cross my fingers? I suppose I could try it and find out the answer for myself. However, before doing that, I thought to ask your advice.

B. I did lose a hive last winter. In cleaning up, I find a number of bees died in the cells. I could pull most of them out. However, if I leave a few still in the cells, will the new workers dispose of them? Where there was a small cluster between two frames, there is a 3-inch diameter circle of mold from their dampness. I can wash this with warm water and leave it exposed to sunlight. Need I do more/what?

As always, your classroom notes are a great companion and stimulus.

Thanks,
Gordon Shaw,
Concord, MA

A

Gordon, I think cleaning off the plastic foundation and recoating it with beeswax is worth a try. Try it and let me know how well it works. It might be tough to remove accumulated old wax from the insides of the plastic hexagons. Although labor-intensive, there is no reason it should not work as long as you do not damage the plastic hexagonal cells and you add a nice coat of clean beeswax.

The bees will clean out the cells containing their dead sisters. Clean the mold with a solution of water and household vinegar and all should be well. Let the combs air dry before reusing them. Bees will generally clean up the mold themselves, but it certainly does not hurt to give them a helping hand.

Q Powdered Sugar Varroa Control

Hi Jerry, I always read your column first thing when my *Bee Journal* arrives. I enjoy and use the practical advice you offer. Now in my second year (both our hives survived the winter and are thriving) - I find I know as little as I did the first year! (smile)

I have time to do powdered sugar dusting for varroa control every 3-4 days. Question: Do I need to separate the hive bodies every time or can I simply dust down through the second deep and hope it makes it to the bees in the bottom deep?

And, I understand if you have honey supers on you are not supposed to use powdered sugar - but if I am going to leave the honey for the bees, is it okay to use the powder treatment when supers are on? It seems that if I can't dust when the supers are on, I am not dusting much as our bees are moving quickly to honey production this year. If it is okay to powder with the super on, should I then dust through the super, or take that off and dust just the deeps?

I understand that we are not to go into the hives as often as our first year when we were learning the raw basics, so I am hesitant to separate the deeps every 3-4 days to dust.

Thank you so very much for being willing to answer our questions. I'm sure they are the same ones over and over...

Leann in Maine

A Hi Leann, if you think you know less now, wait until next year:) Most Varroa (90+%) will be in the brood nest area. That is where potential mating/reproduction is available on developing larvae/pupae. For best results in using the powdered sugar to help remove exposed mites, you need to have access to the bees. In a perfect world that would mean dusting every bee in the brood nest box(es). In an imperfect world, instead of using 1 cup of powdered sugar per deep brood box, leave the brood boxes together, use 2 cups in the top box, and hope it filters down to something like a cup in the bottom box. I'd take the supers off, not so much for preventing honey contamination, but because this is not where varroa is or should be.

As the manager of the honey bee colony's home, I would get into them as often as you feel you need to: 1. Learn what is going on in the hive in relation to food resources coming in, queen response, diseases, pests and 2. Have fun by exploring and learning about the honey bee's world. Once a week is not too often. Remember, this is supposed to be a fun hobby!

Q "Bearding" Is Normal on Hot, Humid Days

I know *bearding* (bees clustering on the outside of the hive entrance) is normal, but out of our eight hives, this is the only one that is doing this. Should I split this one, add a deep, or just leave it alone? I saw this behavior last year, but with far fewer bees on the outside, and all of the hives were doing that.

Thanks for your time,
Darris and Jennie Hawthorne

A Think of honey bees as a living thermostat. When it gets warmer and more humid, they expand and when it gets cooler they contract. Honey bee colonies are variable in size and strength. They are not all the same. This colony must be larger, have more brood and perhaps be bringing in more nectar that has to have its moisture decreased to make honey.

The colony has expanded in the 90 degree heat and the bees are trying to maintain a certain temperature and humidity in the colony. So, some are hanging on the outside. Your job at this time of year is to see if they need more room in the brood nest, more supers, some ventilation, etc. If they are crowded and have lots of brood, they may want to swarm. Therefore, you will need to move some frames around and make more brood rearing room for them. This may mean adding another brood box or giving a few frames of brood to one of your weaker colonies. Then, give the strong, crowded colony some empty combs in the brood nest boxes. Of course, also make sure that the strong colony has plenty of supers if they are in the midst of a honey flow. Cut out swarm queen cells if these have already been started.

In hot weather or when crowded honey bees "beard" up on the outside of the hive.

Keep them from swarming if you can since swarms reduce your hive population by about half and often weaken the colony so that it cannot take full advantage of coming honey flows. This is a signal for you as the "manager" to see what may be needed from a management standpoint and this is part of the fun of beekeeping.

Swimming Pools – How Do We Keep the Bees Away?

by THOMAS C. WEBSTER
Land Grant Program
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For many summers we encountered a problem – our neighbors complained about our bees in their swimming pools. We know that bees need water to cool their hives. And their need comes just when people enjoy taking a dip.

First, we tried the standard "solutions" to this problem. We put out large buckets of tap water with various concentrations of salts. Blocks of wood floating in the water were supposed to allow the bees spots to perch while they consumed the water. We attached Nasanov pheromone lures to the wooden blocks. No luck. The bees ignored our water buckets completely.

The situation at one of our bee yards was especially frustrating. A small farm pond about 20 feet in front of the hives held no interest for the bees. Instead, they flew over a densely forested area to the neighbor's pool about a quarter mile away. No doubt, the scout bees' waggle dances inside the hives were directing their nest mates to the pool. This is the sort of problem that's irritating on a bad day, and interesting on a good day.

Let's consider that bees perceive their environment outside of the hive primarily by vision and smell. By these two senses they can find flowers, a hive intruder, or a pool of water. How does the neighbor's pool differ from the farm pond?

Visually, the swimming pool is large, nearly always in direct sunlight, and without weeds at the edges. It is important to know that sunlight becomes polarized when it reflects off of the water surface. Polarized light is light that oscillates all in one plane. Sunlight and light reflecting off of most other objects is not polarized — it oscillates in many planes. Many insects that live near water, such as dragonflies, see polarized light distinct from unpolarized light. This helps them find lakes and ponds from a distance. Their eyes act like the polarizing material in most sunglasses. Similarly, a polariscope used to judge honey has two sheets of plastic that polarize the light passing through a bottle of honey.

Honey bees also have the type of eye structure which allows perception of polarized light patterns. Blue sky has patterns of reflected polarized light, according to the position of the sun. If the bees can see just a patch of blue sky, they can calculate the position of the sun, even when the sun is behind clouds. This is important for bees communicating the direction of blooming flowers, with their celebrated waggle dance. With just a patch of blue sky, scout bees can give good waggle dance information to their nest mates.

And it is likely that bees find water sources by the reflected, polarized light. However, this can happen only if the water is in direct sunlight. Weeds and trees around a pond will block the sunlight and the reflected light.

These bees are busy on a pool toy in a wading pool. We can see that only the lower bee is collecting water. The others are licking minerals that have dried on the toy surface. This tells us much about what bees need in summer.

The odor of the water source might be important also. Most people add chemicals to their swimming pools, and the bees can certainly smell these chemicals. And most municipal tap water (used to fill pools) contains minerals like iron and calcium and is treated with chlorine and fluorine. We can distinguish the taste of tap water from the taste of distilled water, so the bees certainly can too. It is likely that the chemical smell makes the water more attractive, because it indicates the presence of some minerals. Bees require many different types of minerals, and water can be a significant source of minerals.

With all of this in mind, I bought a small wading pool used for toddlers. It's 6 feet in diameter and fills to about a foot with water. I put it near a swimming pool plagued with water-foraging bees, and filled it up. It was in direct sunlight for most of the day. Next, I grabbed a few pool toys from the swimming pool, including the bees perched on them. I carried the toys and bees to the wading pool. No complaints from the bees. They were happy to collect water at their new spot.

Finally, and perhaps most importantly, I needed to make the big pool unattractive to the bees. This was accomplished with a squirt bottle of insect repellent. The active ingredient "DEET" is as offensive to bees as it is to mosquitoes. I sprayed the inside perimeter of the big pool with repellent, just above the water line. Likewise, I sprayed the pool toys that remained in the big pool.

This worked very well. I returned with the insect repellent every day for a while. Eventually, the repellent was unnecessary as long as the wading pool contained tap water and the same pool toys. Possibly, the bright colors of the toys helped the bees orient to their new water source.

This summer I hope to try some variations on the theme. Perhaps I can have success beginning with the wading pool close to my hives, instead of right next to the big pool. Other materials might be as effective as insect repellent. For example, I've been told that vegetable oil sprayed from a can will repel bees. No doubt, other beekeepers can elaborate on these ideas.

The Mystery of the Hive

Part Three of Three Parts

Smells Like Queen Spirit

by PETER LORING BORST
Ithaca, NY

I have attempted to present the case for the queen's dominance of the colony, but it is far from unanimous among researchers as to what the actual role of the queen substance is. Recently Yves le Contes, the world renowned bee researcher, asked:

"Do queen-borne behavior-modifying chemicals constitute bona fide primers that regulate worker physiology directly, or do they act as informative signals to workers, indirectly influencing worker physiology and behavior in a context-dependent manner?"

Is it the medium or the message? The scent of the queen is never more obvious than when one observes a cloud of drone bees forming the characteristic comet shape in pursuit of an eligible queen bee who happens into the area where they have been congregating. Equally amazing is watching the phenomenon of huge swarm of swirling circling bees come quickly to a focal point the size of a watermelon, around the precise spot where their queen has landed,—for reasons of her own, no doubt.

But can the queen regulate the mood and labor of the hive simply emitting a chemical messenger? At first this may seem hard to imagine. But if we take an imaginative leap, we can see that a constant stream of sweetness could be likened to an environment always filled with music. We know that music can profoundly affect our moods, alternately exciting and pacifying us. And we are certainly familiar with the various ways music is deliberately used to alter the psychological state of people. There is soothing music in elevators, jaunty music in supermarkets, military bands lead patriotic parades and the music at church puts us in a mood of worship and praise.

Say it with Flowers

Bees, having no particular organ like an ear with which to perceive sounds passing through the air, appear to make little use of sound waves. They are sensitive to vibrations within the hive, which they pick up through their feet. However, they are acutely attuned to the odors in and outside the bee hive. Floral fragrances lure them many miles from home offering the promise of nectar and pollen — a promise they don't always fulfill. Bees seem to be antagonistic toward, almost offended by the smells of animals, as if the hairy and sweaty does not belong in their world. Certainly their arch enemies: bears, skunks, badgers, etc., are all fur and claws.

As beekeepers all know, the easiest way to gain control of a hive of bees is to blow thick smoke into its waxen chambers. Some writers in the past suggested that the effect it produces on bees was due to their association of the odor with forest fire, and that it causes them to fill themselves with honey in preparation for fleeing the hive. This is a fanciful notion, not really based upon any facts. My own belief is that smoke has intoxicating effects on bees, but at the very least it makes it impossible for them to use what is perhaps their principal mode of organization: pheromones.

Variety is the spice of life

Using just a few different factors in different proportions can result in a vast variety of flavors and moods. Using the example of wine, we know that folks can easily detect such components as sweetness, alcoholic content, bitterness, acidity, freshness and

Buckwheat—Floral fragrances lure honey bees and other bees many miles from home offering the promise of nectar and pollen.

bouquet, as well as more subtle effects like manner of fermentation and age. All this in one mouthful. Well, some people can anyway. I am better at discriminating types of ice cream.

Keith Slessor describes the gamut of aromatic social signals. He lists the well known banana smell of isopentyl acetate, the honey bee alarm signal, which is contained in their venom; the seven-component Nasanov pheromone with its lemon-grass fragrance, which the bees use as a come hither signal; the honey bee sex pheromone with the unspeakable name of 9-oxo-(E)-2-decenoic acid, described as fruity or soapy scented; various esters including oleates, stearates and palmitates, which are well known to makers of perfumes and cosmetics.

It hardly seems likely that such a rich palette of odors and flavors would not be perceptible to the bees of the hive, and would not influence them in a variety of ways. Slessor et al propose the concept of "passenger pheromones" which ride along in the queen substance in order to perform some specific action downstream in the targeted recipient. They assert that "chemical communication might equal or exceed the complexity of the better known auditory and visual systems of vertebrates."

White Dutch Clover

Lamium—A rich palette of odors and flowers is perceptible to honey bees.

Let's get together

Insect colonies have long been regarded as ideal societies because of their extraordinary level of cooperation and efficiency. But, ever since Darwin proposed the idea of evolution by natural selection, biologists have been challenged to explain altruism. If nature's law favors survival of the fittest, it would seem to favor self-serving behavior and offer little or no reward for sacrifice. If a species had a tendency toward selfless behavior, how could such a trait possibly be passed on? The solution appeared at first to be kin selection. If individuals sacrifice themselves for their kin, then genes for altruism could be passed on. But Francis Ratnieks developed another line of reasoning. The workers in an insect society are unwittingly doing the bidding of the queen. They are coerced into performing the tasks of the colony instead of being reproductives themselves. This very neatly explains what we have seen—the presence of the attitude-altering substances, the suicidal behavior of the workers in ant, wasp and bee colonies, the influence the queens seem to have over their nest mates, despite their physical vulnerability. Ratnieks and Heikki Helantera plainly state:

"The examples, theory and evidence make it clear that many modern-day insect societies, as exemplified by the honeybee, are harmonious because of effective social coercion."

What Forel, Wheeler and the Huxley brothers had intuited can be borne out by the evidence in chemistry and evolutionary theory. The hive is a brave new world, where the perfection of the elite is made possible by the efforts of thousands of selfless individuals too dull witted to rebel against the system that houses and feeds them. And why should they? Is not their life of work and death appropriate? Would they prefer to take the place of the queen on her throne, fated to be an egg-laying machine all her born days?

Then again, perhaps it is better to believe that each actor willingly plays her part, that the harmonious working of the insect colony is living proof that a society can indeed prosper if the chief goal is the common good, rather than the special needs of the few. Honey bee researcher Sarah Kocher has been studying this very question in great detail, and arrives at a different perspective. Her explanation is that the queen pheromone is acting as both an honest signal of queen fecundity, *and* as a control mechanism that prevents workers from rebelling and laying their own eggs. According to her view, the chemical communication system between queens and workers is a dialog rather than a simple, one-way signal. Her studies suggest that queen pheromone is acting as an honest signal to the workers, and that workers are willingly enforcing this sig-

nal. Many authors have pointed out correctly that the workers benefit from this arrangement. What they do not gain is the opportunity to reproduce.

So, we have looked a bit at a variety of insect lifestyles, from solitary bee to colonies of nearly a million members. To us, as beekeepers, a colony of *Apis mellifera* honey bees seems about as ideal as one could have, especially when compared with its odd cousins, *Apis florea* and *Apis dorsata*. *Florea* colonies seem too little and pathetic, while *dorsata* bees are huge and relentlessly vicious. *Mellifera*, with the sweet name and disposition, are just right, thank you. But to mother nature, we are all the same. She doesn't regard the honey bee as the crowning achievement of a line that began with primitive wasps so many millions of years back, any more than she would point to the human race, and say: "of all the primates, that is the best I have done."

And yet one would be wrong to not marvel at the achievements of evolution in producing such a system of order and communication which rivals our own in complexity and usefulness. In their book on Biosemiotics, J. Eder and H. Rembold (non-beekeepers) write:

"In the ants, bees, wasps, and termites, most behavior has no meaning except when fitted into a total pattern of semiotic interactions between colony members. This hexapod empire is held together by chemical communication. Various combinations of chemical and tactile signals are employed as powerful attractants, for kin recognition, for foraging strategies, etc."

"Honey bees clearly represent the zenith of chemisociality. A large variety of behavioral modes has been demonstrated to be regulated by pheromonal signals originating from diverse exocrine glands of either worker or queen. The caste system above all and the resulting division of labor display a communicative elegance which points to a close linkage between biosemiotic structures and social organization."

Meanwhile, Yves le Conte, a world renowned bee researcher says nearly the same thing:

"The success of social insect colonies lies in all members of the society acting in concert and in a well-organized manner. At the foundation of social insect self-organization are sophisticated means of communication, the chemical mode being at the center of it."

Mystery of the Hive

One of the chief attractions of honey bees and so, of beekeeping, is the sense that one is wandering into a different world, a different order of reality. Maybe, we think, some of nature's secrets will be whispered to us. But, alas, nature keeps her secrets well, and is not one to confide. Yet somehow that can be reassuring, too, that no matter how smart we think we are, there will always be more to know and perhaps there will always be things that we will never know.

For many years, one of the deepest mysteries of the hive has been taking place right there in plain view, on the front of it. Most beekeepers have witnessed at one time or another that peculiar activity that has been given the name "washboarding". On a late summer's afternoon hundreds of honey bees can be seen pacing to and fro, heads pointed downward. They take a few steps forward and a few steps back, tapping the wooden hive front with their antennae, for hours. Many a beekeeper has wondered aloud, what on earth are they doing there? The various explanations offered have never really quite matched up with what we see there. It is, how shall I say? — just plain puzzling. Busy as a bee, so they say, but busy doing what? It almost looks like some sort of idol worship! Are they paying homage to the queen?

Imagine my surprise when I uncovered what may really be the explanation for this weird to and fro rocking at the threshold of the hive. I had my head stuck in a book, late one night, when the answer leapt at me from the page. The book I was reading was called "Pheromones and Animal Behaviour" and the author was explaining how honey bees share many habits with paper wasps. The paper wasp nest is the one that appears in scenes where Pooh Bear is contemplating a "hive". Evidently wasps imbue the paper material of the nest with secretions from their abdomens, which give each nest its own characteristic odor. Naturally, the papery material easily absorbs odors.

Watching the honey bees performing their ritual, it occurred to me that very likely this is what *they* are doing. The skittery movement of their little feet resembles nothing so much as the spreading of some sort of invisible paint all over the front over the wooden hive front, all the while checking it with their odor sensitive antennae. If they painstakingly applied an odorous substance, soon the whole front would be an odorous beacon which said in its own way to weary foragers returning from the fields, home sweet home.

Milkweed

Spotted Knapweed

Yellow Rocket

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The Traveling Beekeeper

A Visit with Joe Latshaw

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Every time I visit with Joe Latshaw he surprises me. In a recent visit to his home outside Columbus, Ohio, he was able to share several new items with me.

Latshaw is a low-key sort of person, but one with an enormous interest and intellect into bees and bee breeding. And that is a starter hst. He has been around bees and bee breeding most of his life and can claim a quarter century of beekeeping experience, while being only in his early 30s. The son of a poultry nutrition professor at Ohio State University, as a boy Latshaw would shadow the apiary assistant at the OSU Beekeeping Laboratory, and produced his first queens when he was 12. This has provided Latshaw with a range of valuable experiences, contacts, and most recently a doctorate in bee behavior. He does some contract college teaching, but is not associated with Ohio State University. Basically, he is a beekeeper and a bee breeder, working for himself.

From his modest home and farm sandwiched between four-lane highways and suburban condos, Latshaw keeps bees, raises queens and instrumentally inseminates over 900 queens every year for testing and for release to cooperating beekeepers who use the bees as grafting mothers. His program is for beekeepers needing 1000 to 10,000 or more queens a year, and is clearly not for the typical small-scale beekeeper. Instead, the two lines, one yellow and one black, provide a choice for beekeepers who want production queens for an intensive queen rearing season. Many of the users of these queens are large commercial beekeepers who generate thousands of daughter queens for production hives and for nucleus hives for sale.

Latshaw filled a void left with the absence of an American producer of an instrumental

(l) Wood and plywood boxes for overwintering stock at Latshaw Apiaries. Note the board at the back of the hive stand to insure water drainage from the nucs. (r) Latshaw uses a special device to hold the semen from over 500 drones; he has a small card he uses to estimate the amount. He uses this device to inseminate a large number of queens with sperm collected from far more drones than they could mate with in Nature.

The frame for the cardboard hive uses a piece of corrugated plastic and a small wooden dowel for comb construction.

Latshaw is looking at a very low cost mating unit made from cardboard, plastic materials, insulation and foil. These would be used for single-use mating.

insemination device, and has sold one for several years, the type that allows the operator to pull on the sting of the queen in order to eliminate the use of a hook to move the queen's valvefold out of the way for the syringe. In 2009 he released a newer, and much less expensive devise that will be within the range of serious queen breeders everywhere. Both may be examined at his website **www.latshawapiaries.com**. Joe's wife has organized another instrumental insemination training program for the fall: the Latshaw website indicates the program is filled for 2010.

He has also developed a large volume syringe for the mass collection and mixing of semen from 500 or more drones—so that queens can receive a portion of each drone's genes. Remember, the average queens mate with about 13 drones, so this technique offers some remarkable results. Such a process has several beneficial effects for the breeding program. First, it reduces the potential for inbreeding to a very low level when the operator uses drones from a wide range of colonies. Second, it has given Latshaw the ability to collect drones from survivor

(l) Carbon dioxide tank and regulator used to sedate the queens during insemination and stimulate ovary development. (r) A cold weather grafting frame places the grafted cells into the center of the brood area. When conditions are not favorable, Latshaw will graft as few as 12 cells to insure queen quality.

(l) Incorporating instrumentally inseminated queens, Latshaw uses this commercially made four-way nucleus box to hold queens. Each block of wood serves as an inner cover. A regular cover fits over all of them. (r) A row of the four-way nucleus boxes in the Latshaw apiary.

(l) Inside the card board mating box, Latshaw has three plastic sheets cut to allow bees to build comb. A feeding area is at one end for queen candy or a plastic bag feeder. (r) View of large-volume semen collector.

Looking into the inside of one of Latshaw's wooden five-frame nucs, you can see how he has made an entrance from a circular cutout drill, about 1 3/4 to 1 inches in diameter.

Dr. Joe Latshaw in his fruit tree orchard, April 2010.

colonies from around the United States, mix their sperm together, and inseminate queens with a small amount of this mix. Genetic diversity is enhanced, and the possibilities of selection of stock with this number of drones will allow a breeder to work quickly to find suitable queens. It is a brilliant concept combining simplicity with brute power.

But this is not the limit of the surprises he offers. He has a quiet and unobtrusive way of working—the insemination area is set up in the basement he shares with the family laundry. He uses basic concepts and does them well. Working with his father, he researched a nutritional supplement that fills the void between bee-collected pollen and soy flour. He started marketing this product this year, again for the large-scale producer—a single bag of the supplement makes a ton of bee feed. That's more than I need.

Last year he was awarded a grant (SARE=Sustainable Agriculture Research and Education) and purchased polystyrene nucleus boxes to overwinter five-frame nucleus hives he makes during the summer. In open-air wintering (see his website for photos), he was able to get 33 of 36 of these colonies through the winter with two to five frames of bees. These were vastly superior to the traditional five-frame nucleus boxes he has used in the past, and used as a comparison. These plastic boxes are a product of Canadian research, and feature a solid bottom that serves as a feeder. When a colony needs to be fed, a liter of sugar syrup can be added (through a special opening so the bees are not disturbed) and the bees move to the bottom of the frames to feed on the sugar solution. With the strong interest in wintering nuclei in much of the colder areas of North America, I suspect that this information will trigger a number of beekeepers to try these boxes. For every over-wintered colony that emerges in late winter and early spring, the savings in package bee costs or nucleus hives is enormous. When summer queens are locally produced by beekeepers using survivor and mite-resistant stock, they have an excellent opportunity to inexpensively winter queens and have them (and their colonies) available in the spring. And, the amount of feed needed per colony is not excessive, especially compared to traditional full-sized colony wintering needs and with 35% or more winter loss in many Northern states. Latshaw will continue this line of work.

Queen work

Latshaw values older queens as a continued breeder source, and has some queens in production sized colonies that are four years old. These "grand old ladies" obviously possess some genetic information for longevity, and one hopes they will pass this on to their daughter queens, as well as their worker granddaughters. A worker that lives ten percent longer than her sister will add greater productivity to the colony in honey production, nest temperature management and wintering ability.

With an eye on queen quality, Latshaw may do a graft of only a dozen queens, making sure they are all very well nourished. He has a special grafting frame that has comb sections to provide food on the comb where cells are being produced. This is especially useful during the first spring grafts, when outside temperatures restrict queen acceptance and feeding. The results will be large queens that will be better able to be introduced and maintained in colonies.

It is no surprise to me (but a bit disappointing) that commercial beekeepers in the United States still want a big yellow queen

Latshaw holding one of the polystyrene hives used to over winter nuclei hives as part of a SARE grant.

Stack of polystyrene nuc boxes in storage.

that has a huge brood production behavior. This is, of course, what the old Starline hybrid did. These queens are easier for crews to find and check, a fact that saves them money. Large egg-laying rates mean the colonies build when the beekeepers make up nuclei and they will be ready for almonds or pollination contracts without a delay in population buildup. Unfortunately, one of the side effects of using these bees is that they tend to be the ones that are least resistant to varroa and tracheal mites, and thus require miticide treatments of some sort. This keeps the large honey producers on the chemical treadmill, unable to get away from treatments because the bees they want to use are not developing resistance, as well as some of the other stocks, which tend to be dark in color. Latshaw has tried to incorporate some of the genetic information from resistant lines, but commercial users require large colonies headed by queens with large egg-laying rates.

We discussed the development and use of the darker line in hobby and small-scale beekeeping operations. Latshaw has worked with the Ohio Queen Program operated by the Ohio State Beekeepers Association, a program that has hit some road bumps recently. There are a few of the beekeepers in the program who are producing a number of queens.

It is easy to stand back and keep quiet as others write and speak about the direction the beekeeping industry is taking regarding stock selection and the development of resistance. There are strong economic reasons to follow the dollar and provide customers what they think they want rather than what they need. Or, take the time to say WHY they need as better bee. Latshaw is in that very rare and unsafe place within the industry—he has academic training AND is a commercial stock producer. For that reason, Latshaw has found it necessary to spot treat both his Carniolan and Italian colonies for varroa when absolutely necessary. The Carniolans do a 'far better' job at handling varroa on their own, but Latshaw knows there are a number of other qualities that need to be considered. He feels that it is important to match his pure lines to the many facets of beekeeping and climates, looking at the interaction of beekeeper expectations and the environment. "Each type of bee has its good and bad points, I just try to produce the best stock I can for whatever application beekeepers come up with."

For the Latshaws, bees are just part of their life. Joe has his orchard, and Leah has her vegetable garden. Their two-year-old son is exploring and doing what two year olds do best. There are new things to try in the basement and the shed, new beekeeping ideas and methods that may have a market for beekeepers around the country, if not around the world. It is a good idea to keep in touch and see what new developments come out of this quiet man's creative process.

Dr. Larry Connor considers himself 'old school' when it come to training someone in instrumental insemination, and strongly recommends looking at both of the Laidlaw instruments for the development of a regional or personal bee breeding program. But first, you need to know how to raise queens, and one more 3-day class is scheduled for July in Galesburg, Michigan. Contact www.wicwas.com for course information and the current bee book list.

Honeystix

An American Dream Is Still Alive

by DEWEY M. CARON
Emeritus Professor University of Delaware
& Affiliate Professor Oregon State University

Undoubtedly, you have seen Honey-filled straws for sale at your community golf course, grocery store, farm market or on the counter of your local restaurant. Literally "liquid honey in a straw" they are the better "mousetrap" in value-added sale of honey, turning $2 a pound extracted honey into a $22 a pound honey sale.

Honeystix® are an exclusive product of Nature's Kick Corporation. The World headquarters of Honeystix is in Salem, Oregon. Glenn Peters, president of Nature's Kick, invented Honeystix in 1980. Nature's Kick continues to be the producer of all major brand names of Honeystix, Honeystraws, Honeysips, and Honey Sticks in the world.

Honey-filled straws started when Glenn was a young man learning beekeeping from the local Willamette Valley bee association. In 1980, Glenn was Oregon's youngest commercial beekeeper and his honey garnered top prize in the Oregon State Fair competition. Selling honey at fairs and door-to-door, he was confident that people would buy his honey if he had a way to let potential customers conveniently taste his product.

Glenn says the genesis of development of Honeystik really began on his eighth birthday when he received the popular toy "Erector Set," as a present[1]. He quickly conquered the designs included with his set and went on to develop his own "inventions" which eventually led to his design of the first Honeystix production prototype.

Packaged honeystix in various flavors.

Starting with his hand-filling machine, Honeystix popularity grew quickly. Glenn sold the bulk of his bees to gain capital to work on an effective straw-filling machine. His first production facility was his spare room (licensed as a food manufacturing facility). Nature's Kick built their current manufacturing facility in 1986 as the millionth Honeystix was sold. By 1996, the 4th generation of Nature's Kick filling machine was producing 10,000 Honeystix per hour. Nature's Kick currently has the capacity to produce a million Honeystixs each day.

In 1986 Nature's Kick and GloryBee Foods of Eugene, Oregon, teamed up to create the very first flavored Honeystix. . . Peppermint! Then came straws with the flavors lemon, cinnamon, and licorice. The company continues to expand flavor lines to entice new consumers - Nature's Kick currently offers 20 original Honeystix flavors, 6 Sour flavors, and 10 Floral varietals. They convert customer honey into custom straws from as small as a 5 gallon container, which yields 4000+ straws.

Honeystix have always been a favorite of kids. Marge Uhrey, secretary of the Oregon Beekeepers Association, remembers Glenn donating Honeystix for her classroom presentations. One time Glenn entertained her students by playing a tune on an empty Honeystix. At the 1996 Federation meeting in Portland, Glenn arrived with a massive 5-foot filled honey straw.

Nature's Kick remains family owned and Glenn works alongside his sons and daughter. Future plans are to develop marketing strategies for an effective means of educating consumers on honey and its value. Nature's Kick is concerned about the environment, so the straws they use are earth friendly. The empty straws are photo sensitive and will break down in about 6 months.

Nature's Kick is donating Honeystix to the 2010 WAS conference in Salem, Oregon, August 29 through September 2. Glenn will present a workshop on "Thinking Outside the Honey Jar—Honeystix, an American dream." Honeystix, has proven the test of staying power as a unique "value-added" means of selling honey.

Glenn Peters, president of Nature's Kick Corporation, makers of Honeystix

[1] An interesting note: Salem, Oregon is also the home to A.C. Gilbert, the creator of the "Erector Set." Gilbert's family home is now the Gilbert Discovery Museum on the Willamette River Waterfront just five miles from Nature's Kick Honeystix headquarters.

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Breeding Bees for Resistance to Parasites and Diseases

by GREG J. HUNT
Purdue University

Those of you who have been keeping bees for over 20 years remember a time when bees pretty much took care of themselves and we expected at most 10 percent winter-kill. But ever since mites were found in the US in the 1980s, we expect to lose 25% or more of our hives each winter and we need to think about controlling the mites. Recent surveys indicate that the biggest impact on colony losses can still be traced to the presence of *Varroa* mites and the diseases associated with them (Currie et al. 2010; Dahle 2010; Guzmán-Novoa et al. 2010; Peterson et al. 2010). In the winter of '95-'96, we lost more than half of the colonies in Indiana, primarily because of *Varroa* (Hunt 1998). A recent study even suggested *Varroa* may have been a major factor in "colony collapse disorder" or CCD (vanEngelsdorp et al. 2009). A sustainable solution to this problem would be to breed for bees that can better tolerate Varroa and are resistant to diseases. Efforts for breeding for resistance are now getting a boost from the USDA-CAP honey bee health project. Here is an update on what we are doing.

Dysentery disease. A few years ago, researchers used DNA sequencing of bees with symptoms of CCD and made the unexpected discovery that *Nosema ceranae* was present in the US. This parasite is related to *Nosema apis*, which causes dysentery. We now know that *N. ceranae* has been here for more than a decade (Chen et al. 2008). It is not clear what the impact of this new *Nosema* has been, but we do know that bees often have extremely high spore loads of *N. ceranae* in their guts, even in the summer time. My graduate student Gladys Andino has done some preliminary inoculations of bees in cages to look for variation in resistance to *Nosema*. These cage tests involved emerging bees in an incubator, marking them with paint so that we know what colony they come from, and feeding them spores in sugar syrup. Figure 1 shows that there was variability between colonies for the impact of *Nosema* on survival, suggesting it may be possible to breed for resistance. We are expanding the screening this year to see how repeatable these results are.

Viruses. There has been a lot of recent research on honey bee viruses, but since viral infections require expensive molecular techniques to analyze, it is difficult to know which viruses are causing the most widespread problems and viral infections usually go undetected. It is known that *Varroa* can transmit viruses and weaken the bee's im-

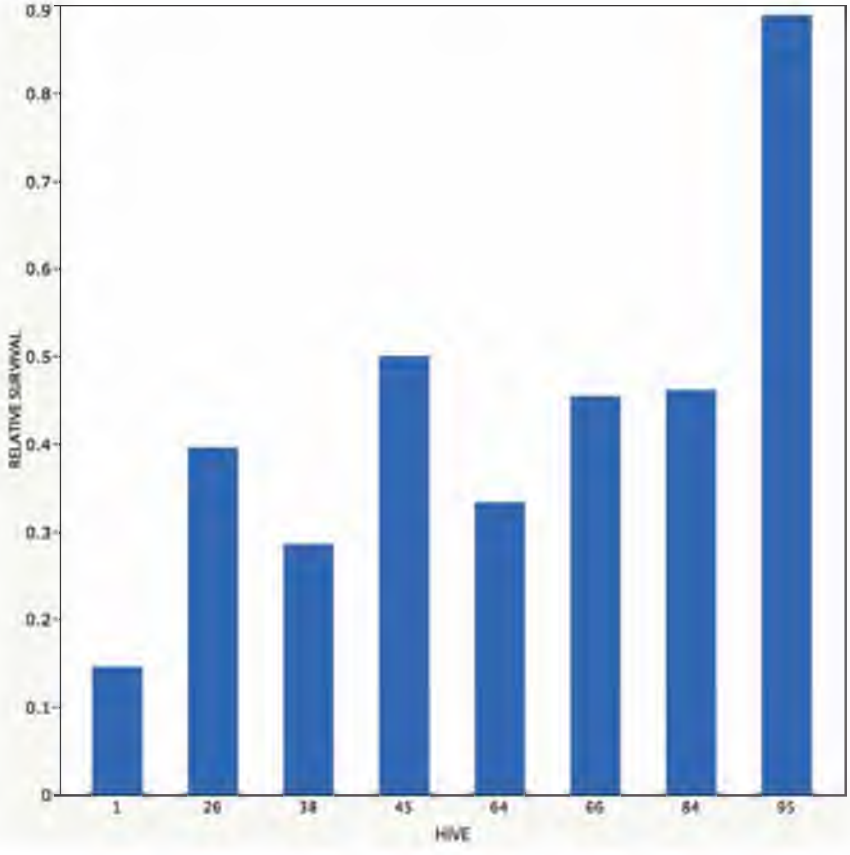


Figure 1. The 8 bars show the relative survival of bees that were collected from 8 hives and kept in cages. Eighty bees from each hive were marked with paint and kept together in cages. Control cages were just fed sugar syrup, other cages were fed 150,000 spores of *N. ceranae* per bee. The relative survival is the survival of spore-fed bees divided by the survival of bees that were not fed spores.

mune system. There is also evidence that some viruses can be transmitted to the egg from infected queens (Chen and Siede 2007; Aubert et al. 2007). Surveys have begun for viruses in the CAP stationary apiaries that were set up across the country. These surveys have shown that many bees have viruses, but show no symptoms. Deformed Wing Virus (DWV) was the most prevalent in initial screens (see earlier article by Spivak). DWV is one of the viruses that are often associated with *Varroa*. We took a look at bees in the Purdue apiaries last year because mite populations were quite high and some colonies began to dwindle in the fall. We rarely treat our bees to control mites and there were no breaks in the brood cycle to reduce mite levels last year. A student in my lab, Alicia Kelley, looked at both dwindling and healthy-looking colonies and analyzed for *Nosema ceranae* and six viruses. She found that all of the 38 hives we sampled had deformed wing virus. Sick colonies were a little more likely to have *Nosema*. Acute Bee Paralysis Virus was strongly associated with both sick hives and colonies that died. Deformed Wing Virus levels were also higher in colonies that were co-infected with acute bee paralysis virus (Figure 2). There may be an opportunity to select for resistance to virus. It seems that the only studies that involved selecting bees for resistance to a virus come from Walter Rothenbuhler's lab 35 years ago – the same guy who first bred bees for hygienic behavior! They found it was possible to select for increased survival of caged bees that were inoculated with the virus that causes hairless black syndrome (Kulincevic and Rothenbuhler 1975). It seems high time we started looking at resistance to viruses, so we plan to collaborate with Judy Chen, a virologist at the Beltsville USDA Bee Lab to try to screen for resistance to Acute Bee Paralysis Virus.

Mites. It seems that sufficient resistance to tracheal mites now exists in many bee populations, so let's focus on Varroa mites. One method that beekeepers use to select for resistance to Varroa is just to let their hives go untreated and breed from survivors. This has shown some success, but may not be the most efficient way. Another method is to import survivors like the Russian bees that the Baton Rouge USDA bee lab brought from far eastern Russia. A third way is to select for specific traits that have been found to confer some resistance towards Varroa. Several USDA and university breeding projects have taken this approach. The Minnesota hygienic lines were developed by Marla Spivak and colleagues, and were shown to have significantly lower mite populations in field studies. The two most important traits for mite resistance appear to be Varroa-sensitive hygiene (VSH) and grooming behavior. Bees with high VSH detect the mites in the cells and uncap those cells, which disrupts mite reproduction. Other bees have been shown to groom mites off of themselves and to bite the mites. At Purdue we have been selecting for bees that have lower mite population growth for years and in the past few years we have been focusing more on grooming behavior. Last year, we used CAP funding to develop a new method for assaying grooming behavior. The usual method involves taking mites that fell from colonies and mounting them upside down on microscope slides to see how many have been chewed by the bees. This method is enough to drive even the most patient grad student a little nuts! My student Gladys Andino now uses a method that involves collecting bees in frame cages and seeing what proportion of the mites the bees remove during a three-day period. She found that the proportion of mites removed correlated with the proportion of mites that were chewed in the colonies that the bees were taken from (Figure 3). This method was presented at the American Bee Research Conference, held in conjunction with the American Beekeeping Federation meeting in Orlando, FL, January 14-15 and a video of her talk will be posted on the honey bee health website (**http://www.extension.org/bee_health**).

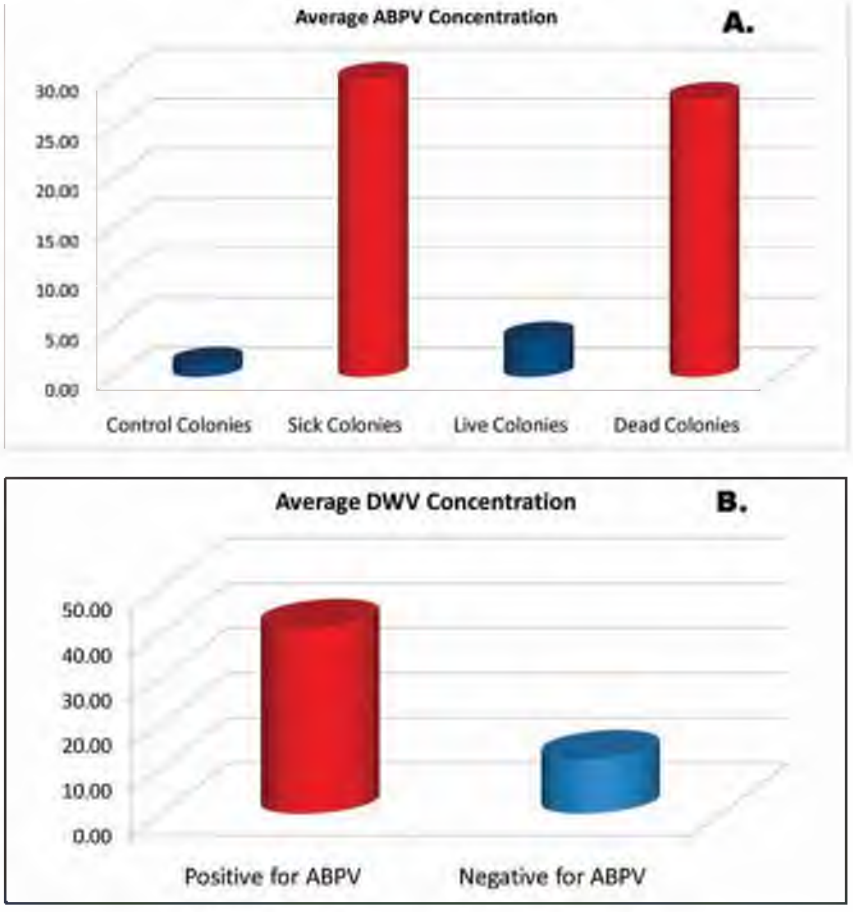
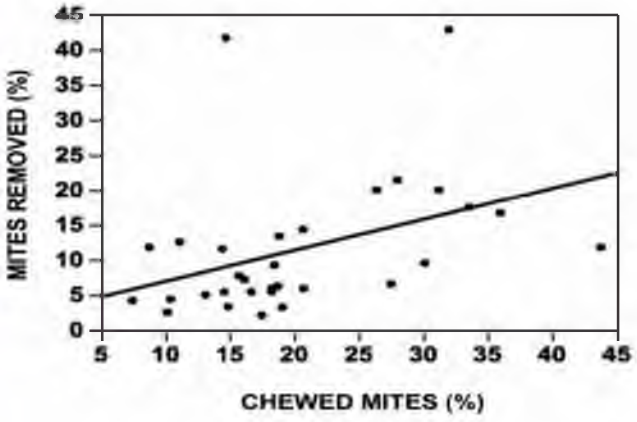


Figure 2. Relative concentration of Acute Bee Paralysis Virus and Deformed Wing Virus in bees. A. Colonies that appeared sick in the fall because the population dwindled and colonies that died during the winter had higher ABPV levels in the fall. B. Colonies that had more ABPV also had more DWV.

The genetics of resistance. It is possible to make crosses between honey bees that represent high and low lines for a specific trait and to then use DNA markers to follow the inheritance of gene regions that influence the trait. In the honey bee, this technique was first used to map genes influencing behavioral traits like pollen foraging and stinging behaviors and eventually led to the identification of candidate genes (Hunt et al. 2007). This technique of "quantitative trait locus" or QTL mapping has also been used to map genes that influence general hygienic behavior (Oxley et al. 2010). The limitation of these methods is that there often are many candidate genes identified and we are still not sure which are the right genes. But if we can find the right genes, maybe we could use DNA markers in the genes or near the genes for marker-assisted selection. Then, we could test to see if bees have the right versions of genes for resistance. Marker-assisted selection might speed up the process of breeding for resistance and allow us to incorporate several different resistance traits in the same breeding lines.

Funding from the USDA-CAP and another USDA grant are being used to map genes that influence VSH and also genes that influence mite-grooming behavior. Jeff Harris of the USDA Baton Rouge Bee Lab has already done the single-drone crosses and analyses of VSH behavior needed for this gene mapping, and my colleague



(l) Figure 3A. Frame cages used for assaying grooming behavior. The tops and bottoms have screen. Mites fall out the bottom onto sticky sheets in the lab and are be counted. After 3 days, mites are also removed from adult bees with powdered sugar and counted. The proportion of mites that drop is calculated as a measure of grooming behavior. **(r) Figure 3B.** The grooming assay works: The proportion of mites removed in cages correlated with the proportion of chewed mites on sticky boards taken from beneath the hives that we collected bees from.

Miguel Arechavaleta-Velasco has done the same for grooming behavior. We will use Jeff's data to compare bees that showed VSH behavior to their sisters that did not perform the behavior. For grooming, Miguel actually measured how long it took for a bee to react when he put a mite on its back. These analyses were done in a single family of worker bees that are daughters of a hybrid queen backcrossed to one of the two parents. In each bee, the DNA markers are inherited along with one of the two versions of each gene (high or low) from their mother. We plan to use a high-tech genotyping system for the mapping. The backcross workers will be analyzed for 1,500 single-nucleotide DNA differences (between the high and low parental lines) to determine whether a gene region came from the high or the low line. Then, we will compare the presence of DNA markers from the high-VSH parent or high-grooming parent with the behavior of each individual bee to associate genes with the behavior. We think this mapping will be at much higher resolution than previous work done in bees. We would like to also extend the QTL technique to try to find genes for resistance to disease, but first we need to identify resistant and susceptible strains.

Selection for any trait is always a work in progress. Breeding is a slow, laborious process and once you stop selecting for a trait, you start losing it. Breeding programs do not provide a lot of publications for researchers, nor do they provide enough economic incentive for commercial queen breeders. Maybe this situation will change in the next few years as people become more aware of the value of helping bees to help themselves. Things that might accelerate breeding for resistance include good inoculation methods, better assays for the traits, understanding the important factors in disease progression, understanding the genetics, and methods for cryopreservation of honey bee semen or eggs. The recent funding from the government for bee research has put many of us researchers on a honey bee health kick, so more attention will be directed at these problems.

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The Primer Pheromones—Reproduction and Survival

Part IV

by Randy Oliver
ScientificBeekeeping.com

Queen Pheromone(s)

We humans hear the term "queen" and immediately project all the royal attributes of leadership and omnipotence upon the mother of the colony. But is this really the case? Does the queen bee really "rule" the colony, with the sterile workers acting as subordinate subjects?

The feeling that I get is that bee society is not that way at all. It appears to me that the superorganism—the colony—is the true decision maker, and that the queen functions merely as the ovary and reservoir of genetics for the colony, and that her pheromones function mainly as reports to the superorganism as to the status of the ovary. Indeed, Seeley (1995) describes "messenger bees that pick up the queen's pheromones and then travel about the broodnest actively dispersing this olfactory indicator of the queen's presence."

As long as the "ovary" is properly mated and functioning well, the colony is content—the presence of both brood pheromone and queen pheromone suppresses ovary development in the workers. However, should the "healthy ovary" signals falter or disappear (Fig. 1), the colony will immediately swing into action to replace the queen/ovary without hesitation or sentiment, via supersedure, or the initiation of emergency queen cells.

I'm using the term "queen pheromone" (QP) generically, since the queen produces a bouquet of pheromonal components from different glands, with multiple functions. Current terminology has moved from "queen mandibular pheromone" to "queen retinue pheromone," since not all components necessary for retinue formation are produced by her mandibular glands. So far, nine components of the full retinue pheromone have been named, but it is clear that there are still others yet to be identified. This brings up a fascinating aspect of QP—there is a genetic component involved in worker recognition of the individual components. ***Some strains of bees do not recognize the queen if certain components are not present in the right amount!***

Practical app: This finding makes me wonder if that is why it is difficult to introduce queens of some strains into unrelated colonies, and whether this might be related to the substantial amount of rapid supersedures sometimes observed after introducing purchased queens. If you are introducing queens of a different stock than the recipient colony, the workers simply may not recognize her pheromonal signals as being "right"!

Also of interest is that the queen apparently signals to the colony as to how well she was mated—queens that are inseminated by multiple drones produce QP that is more attractive to workers than that produced by queens mated to a single drone (Richard 2007). Kocher (2009) found "that the queen pheromone blend is modulated by the reproductive status of the queens, and workers can detect these subtle differences and are more responsive to queens with higher reproductive potential." The quality of the QP produced by any individual queen may have considerable impact upon a colony, regardless of her genetics—Grozinger (2003) found that QP affected the expression of ***several hundred*** genes in workers!

Practical app: Poorly-mated queens (such as those forced to take mating flights during cool or rainy weather) may be quickly superseded. A well-mated queen, on the other hand, functions as a pheromonal "cheerleader" to energize and invigorate the colony, and to boost morale.

Colony Reproduction

There are two ways for a colony to disseminate its genetics (and epigenetics—we'll get to this later) into future generations: by either the production of drones, or by division of the colony by swarming (an unusual process, in that the "parent" leaves, and the "offspring" stays behind). As you can see in Figure 1, the primer pheromones, pollen income, and vitellogenin are all involved in the "decision making" of colony reproduction.

Drone production

Compared to the risky and expensive enterprise of throwing off a swarm, the creation of expendable drones is a cheap gamble for a colony at getting a portion of its genes into the next generation. Even though any particular drone has little chance of actually mating, the colony's investment in that drone is minimal. But by producing thousands of drones, the colony has a good chance at disseminating its genes when virgin queens from other colonies fly out to mate.

Each drone takes a certain amount of colony resources to produce and feed, so the hive carefully regulates the amount and timing of drone production. The mechanisms for such regulation are not completely understood (reviewed recently by Boes 2010). Since the only purpose of drones is to mate with flying queens (generally from other colonies), it is obvious that the best time to rear drones is when they actually have a chance at "getting lucky"—during swarming season, when the air is full of lusty young virgins. At other times of the year, the only value of maintaining a population of drones is that one may have a chance encounter with a supersedure or emergency queen.

Drones are produced, as a rule, only once a colony has reached substantial size, and then only when there is abundant pollen coming into the hive, the presence of which unleashes a cascade of pheromonal signals, resulting in a vitellogenin-rich population of nurse bees awash in jelly, and thus kicking off feedback loops of queen and brood pheromone production. When colony nutrition is poor, the freeloading drones are summarily evicted.

Practical apps: the presence of drone brood is a great indicator that a colony is in good nutritional shape; conversely, their eviction might suggest the need for supplemental feeding. Steve Taber demonstrated that one could get colonies to produce drones even during winter by feeding them pollen patties. Colonies will utilize introduced drone comb to rear more drones than they would without such added comb, but at an energetic cost to the colony (Seeley 2002).

Don't worry about swarming at least until after a colony has produced drones—as far as I can tell, a colony invariably initiates drone production prior

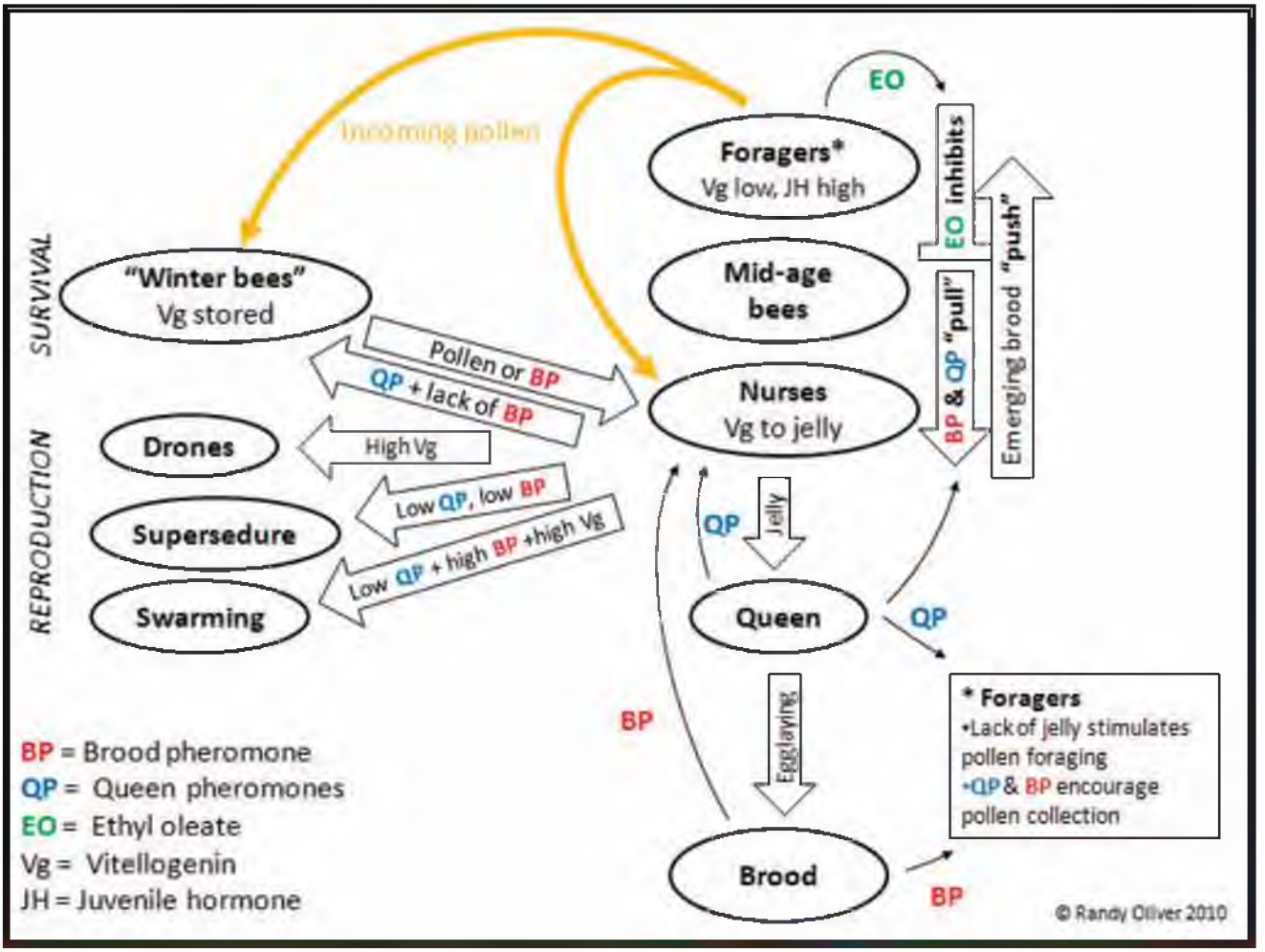

Figure 1. Yet again. Note how critical the levels of queen pheromone (QP) and brood pheromone (BP) are in nearly every aspect of worker division of labor, "aging," colony reproduction, and the transition to winter survival mode.

to building swarm cells. This makes evolutionary sense, since in bad times any rare surviving colonies would want to ensure that there were *some* drones present to inseminate the new queen (surprisingly, apparently no one has tested to see whether the presence of drones is essential for swarming).

Practical Tip: During pollen dearths, colonies stop rearing drones. At that time, varroa are forced into worker brood (this generally occurs during August and September). The combination of nutritional stress and high varroa infestation often leads to virus epidemics in the workers that can spell death for the colony (Sumpter and Martin 2004). Thus, this is the most critical time to monitor mite levels.

Swarming

Swarm production, as opposed to drone rearing, is a risky large-scale investment, with limited potential of founding a successful new colony (most swarms in nature do not survive the winter). The tradeoff is that a swarm has a much better chance at passing on its genes (all of a colony's genetics are carried in a prime swarm –leaving a related daughter in the hive to carry on, with the infusion of genes from drones of other successful nearby colonies).

Swarming behavior is complex. It is strongly seasonal, but appears to be more directly due to colony population size (dilution of QP), the nurse to brood ratio (Vg and BP), pollen availability and the resultant abundance of jelly and Vg (Pridal and Sustek 2000), and age of the queen (QP). (I'm curious as to the ratio of open to sealed brood—in an expanding colony, there is a great deal of larvae secreting BP, but in a pre-swarming colony, most of the brood is sealed).

Lenskya (1981) observed that in crowded hives, the queen avoided the lower edges of the brood combs, and found that by applying a combination of QP and queen "footprint" pheromone to the lower edges of combs, that he could inhibit the bees from building queen cells there.

Because of the substantial economic significance of swarming to the beekeeper, management for swarm prevention has been vigorously debated, but I'll leave that discussion for another article!

Practical app: In short, keep these facts in mind: a colony tends to swarm if it has an aging queen, is in the best nutritional shape, has an abundance of stores (has filled the combs), is crowding the cavity with bees, and the queen has filled every available cell with brood. You can minimize swarming by manipulating the hive to change any of these factors during the relatively short seasonal swarm window.

Survival Mode

The colony will go into survival mode during periods of nutritional duress. The pheromonal trigger for the production of long-lived "winter" or diutinus bees appears to be the presence of QP concurrent with the absence of BP, causing bees that would normally be nurses to ***store*** Vg in their fat bodies (as opposed to converting it to jelly) in order to wait out the dearth.

Other Factors

I would be remiss not to mention that there is more to the allocation of the workforce than just the primer pheromones in Figure 1.

Worker Patrolling

The above model makes for a neat and tidy description of the colony as a factory in which all workers function as robotic automatons, devoid of thought or individual

initiative. However, in reality the picture is a bit more complex, and it appears that individual bees engage in behaviors that appear to include observation, decision making, and leadership.

For example, how do individual bees "decide" whether and where they should be doing any of the other myriad jobs (beside nursing and foraging) involved in running the bee economy? And how do they make decisions such as where to build comb, and whether it should be worker or drone cell size?

Pratt (1988) found, by a series of clever experiments, that comb builders needed to make direct contact with existing drone comb (occupied or not) in order to determine whether more drone comb was needed (it's still not clear exactly how the comb builders then manage to work cooperatively).

Another question is how returning pollen foragers evaluate the pollen needs of the hive. Dreller and Tarpy (2000) found that pollen foragers appear to "individually evaluate the [in hive] pollen to brood to empty cells ratio in order to adjust their foraging effort according to the colony's need."

The above behaviors are examples of jobs largely undertaken by mid-aged bees. These bees form a large generic task force of workers who have given up nursing duties, but have not yet graduated to foraging. Dr. Brian Johnson (2008, 2009) has written extensively about their importance in a colony. Bees of this "age" spend a great deal of time patrolling the hive and evaluating the colony's needs, and then jump into any needed task. They respond to both "cues" (temperature, excessive nectar, debris or comb damage), and "signals" (such as the tremble dance, the stop signal, and the shaking signal given to them by the foragers). Johnson describes how the colony reaches a "dynamic equilibrium" ***through the process of mid-aged bees spending up to a quarter of their time randomly patrolling throughout the hive (often visiting every part of the nest), and then continually starting, quitting, and switching various tasks as needed***. This process may not seem efficient to our eyes, but it appears to work pretty well in the bee colony at getting the various jobs done!

INDIVIDUAL BEE LEADERSHIP

One thing that I find intriguing is the effect of individual worker bee leadership. For example, a few "leader" bees take charge of the initiation of swarm departure. Rittschof and Seeley (2008) found that scout bees with a new nest site in mind jump start a resting swarm of bees into warming up their wing muscles, inspect them to see when they're ready, and then give them the signal to take off! The authors explain:

"It turns out that the scout bees from the chosen nest site are responsible for producing both the piping signal to prime a swarm for take-off and the buzz-run signal to trigger the take-off. We suggest that these bees produce the signal that triggers take-off because they travel throughout the swarm cluster while piping and so are able to sense when the entire swarm is hot enough to take flight. The mechanisms mediating take-offs by honeybee swarms appear to present us with a rare instance where an action of a large social insect colony is controlled by a small set of individuals that actively monitor the global state of their colony and produce a signal triggering the colony's action in a timely way."

As impressive as the behavior of swarm "commanders" is, here's something even more astounding. We're all familiar with the famous "dance language" of honey bees, which is used to communicate the location of favorable food or water sources. This form of communication is hard wired into the bee brain, and requires no thought. However, recent research by Nieh (2010) discovered that if a forager experiences danger at a certain site (such as the smell of alarm pheromone, or the biting of its legs by predators), it may return to the hive and "stop" the dance of *another* forager that is directing bees back to that particular location! The alarmed bee repeatedly generates a vibrating "stop signal" and butts her head against the waggle dancer's, causing the recipient dancer to stop dancing and recruiting. Such a remarkable warning communication sure appears to indicate an unexpected level of intelligence in an insect. However, before you go putting a "My bees are smarter than your honor student" bumper sticker on your truck, be forewarned that some dang scientist will likely figure out that it is merely an innate behavior (Figure 2)!

Some exceptionally large swarm cells from a strong colony that has been enjoying an abundance of forage. The queen, shortly before she is ready to emerge as an adult, emits a pheromonal signal for the workers to remove the cell wax from the tip of her silk cocoon (cell at left). Photo by the author.

GENETICS AND TEMPERATURE

Of course, all the above behaviors vary greatly, depending upon the genetics of each bee strain and the subfamily of sisters in each hive. The environment both outside and in the hive also has an effect. Dr. Jürgen Tautz (2003) found that "the temperature at which pupae are raised will influence their behavioral performance as adults and may determine the tasks they carry out best inside and outside the hive."

SYNTHETIC PHEROMONES

There are currently a few synthetic bee pheromones on the market, with the Canadian company Contech Enterprises Inc. (formerly Phero Tech) offering both queen mandibular pheromone (Pseudoqueen—formerly BeeBoost) and brood pheromone (SuperBoost). I have spent considerable time in discussion with principal scientists from the company, and find them to be quite open, earnest, and helpful. Their products offer new possibilities in hive management.

SYNTHETIC QUEEN PHEROMONE

There are oftentimes when a beekeeper simply wishes that he or she had an extra queen on hand. In many of those instances, a Pseudoqueen strip could be used as a temporarily stand in for the real thing.

Practical applications:

- Use to keep queenless packages "happy"

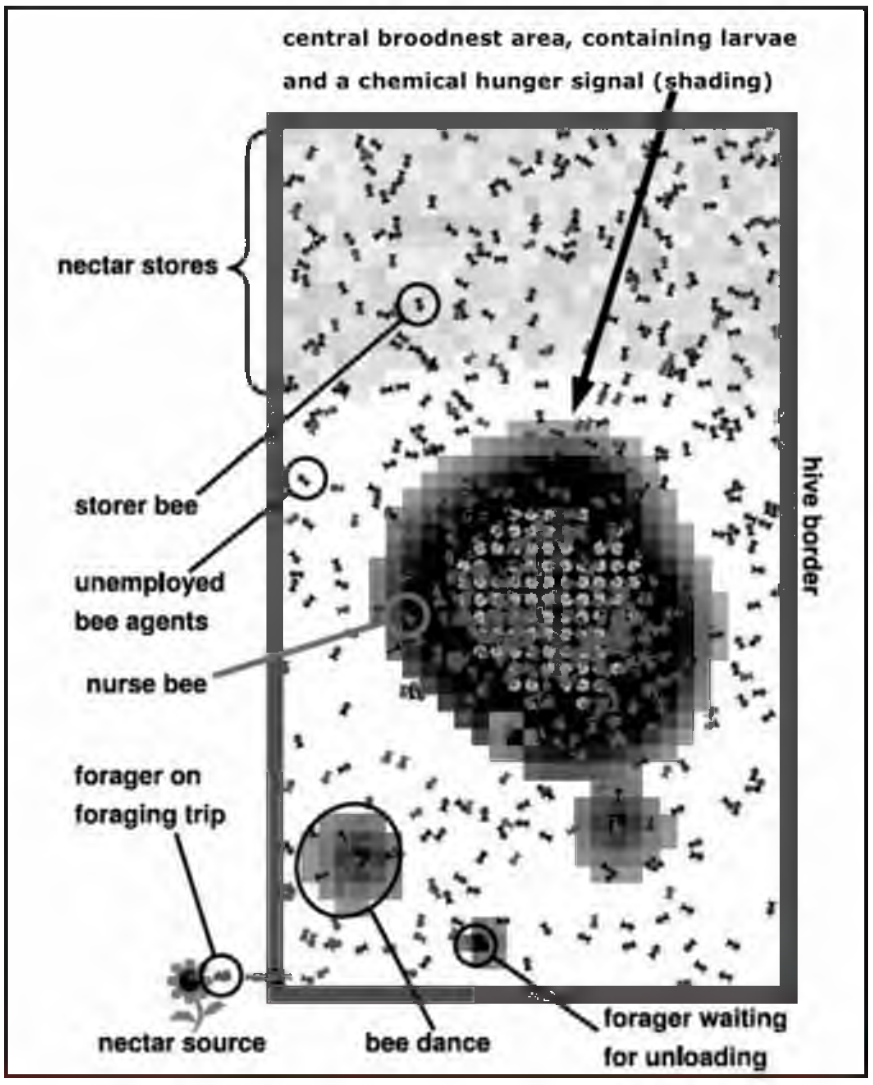

Figure 2. Typical screenshot of a multi-agent computer simulation by Drs. Thomas Schmickl and Karl Crailsheim (2008) that models colony division of labor. They found that live-colony experiments involving brood manipulation, food-deprivation, and colony size could be explained by the mechanisms implemented into the model. Models such as this help us to test our understanding of colony dynamics and behaviors. Courtesy Karl Crailsheim.

- Increase the acceptance of queen cells within a colony
- Improve queen mating success and mating nuc stability
- Capture straggler bees, mop up after swarm removal, or to trap stray bees at gas stations, etc. (add a bit of orientation pheromone or lemongrass oil to enhance the attractiveness)
- Increase pollen foraging in young, growing colonies (but apparently not as much in established colonies—Higo et al 1992)
- Perhaps for decreasing the propensity to swarm?
- Make queenless "disposable pollination units"
- Temporary queen replacement in a variety of situations
- Here's an interesting tip from my friends in Australia to avoid Small Hive Beetle problems in mating nucs. They say that SHB explodes when you pull a queen and put in a new cell. However, if you put 1/3 of a Pseudoqueen strip in, the beetle doesn't cause a problem, yet the new queens still mate out fine.
- I'm sure that ingenious beekeepers will come up with more uses!

Synthetic Brood Pheromone

This new product (SuperBoost) makes some pretty extravagant claims:

SuperBoost stimulates foraging, aids in the revitalization of overwintered colonies and increases honey production.

- Up to 7x more pollen per returning forager
- 276% increase in brood comb in overwintered colonies
- 195% larger adult population and more than double the number of splits from overwintered colonies
- 100% or greater increase in honey production by package and established colonies
- Inhibits swarming

(From manufacturer's sell sheet)

So are the Sales Department's claims hype or could they really be true? (One company scientist is "much more comfortable" with a claim for 50% or greater honey production). From a biological aspect, refer back to Figure 1 to see how the level of BP affects nearly every aspect of hive regulation. Sagili and Pankiw (2007) tested SuperBoost in observation hives, and found that "queens in the BP treatment laid more eggs, were fed longer and were less idle compared to controls." Extra BP appears to supercharge a colony's appetite for food, and to keep it in "buildup mode."

It's one thing to use a synthetic queen pheromone strip as a temporary fake queen to keep bees happy, but something else entirely to make claims that production by our already hardworking bees could be doubled by the application of synthetic BP. Longtime beekeepers are understandably skeptical as hell about such claims, and justifiably wonder if there will be a downside later that will come back to bite them. Contech is very much aware of this concern, and has been tracking the health and survival of colonies after long-term use of the product. To date, this concern appears to be unfounded—the colonies appear to thrive.

I've been over the data from Contech's cited field trials (e.g., Pankiw 2008), plus yet unpublished data from more recent trials provided me by Chief Scientific Officer Dr. John Borden. I must say, it does appear that SuperBoost can supercharge colonies, at least at certain times of the year. Pankiw's trial was during late winter in Texas; a different unpublished trial in British Columbia ran during spring and summer. Certainly, more trials and practical use by commercial beekeepers will be needed to see under which conditions the product works best, the most effective timing, and for what purposes it will be cost effective.

Of course, there is no free lunch, and it appears that in this case you will need to provide the bees lunch—in the form of pollen supplement to get full benefit of the added pheromone. This makes perfect sense—if additional brood pheromone stimulates the bees to produce more jelly, then they are going to need supplemental protein to produce it.

Practical note: The addition of BP increases the nurses' appetite for pollen—be sure to provide supplemental protein if necessary.

So would introducing additional brood pheromone be a relatively natural way of optimizing colony buildup, or would it be

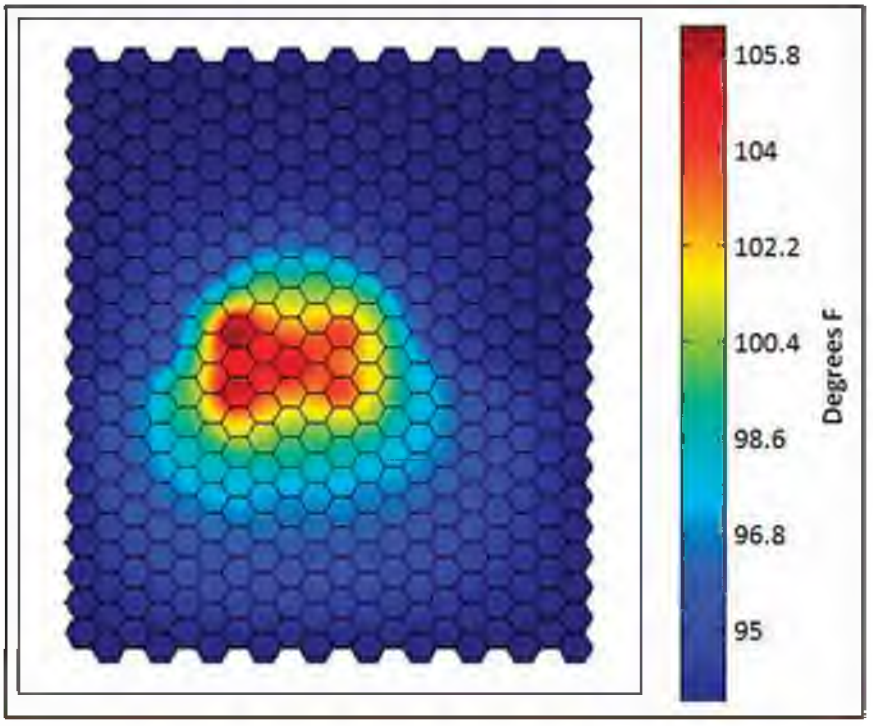

Figure 3. A student model of brood comb heating based upon the thermodynamic model of Humphrey and Dykes (2008). The dark red cells represent heat-generating workers. Slight differences in temperature during brood development can affect later bee behavior. Modified from *Thermal Conduction in Bee Hives* (2009). Courtesy Martin Bracke.

akin to putting your hive on steroids, with unintended consequences? I spoke with Mike Campbell of Campbell's Gold, who ran the Canadian trials last year. He is quite pleased with SuperBoost, and continues to use it to initiate early spring buildup, to induce colonies to take feed and to build up during dearth, and to reinvigorate fall colonies prior to wintering. He hasn't noticed any downside.

Practical questions:

- Could synthetic brood pheromone be used in queen cell builders to encourage jelly production?
- Could it be used to increase the harvest from pollen traps?
- Smedal's (2009) research suggests that exposure to brood pheromone inhibits the ability of young bees to become long-lived "winter bees," so one might wish to be cautious in fall if you're in a cold-winter area. Note, however, that based upon favorable anecdotal observations, Contech plans to run fall trials.
- Could SuperBoost be used midwinter prior to almond pollination to encourage early buildup? I'll publish results of a small test that I ran!

I'd like to add an important comment from Dr. Cameron Lait of Contech: ***synthetic BP treatment should never be thought of as a magic cure for weak or diseased colonies, or for those with poor queens. In order to realize its potential, you should only apply it to healthy, well-fed colonies, with strong queens. The colony must also be large enough—about 10,000 bees (a 3-lb package, or 5-frame nuc).***

Use in Commercial Pollination

SuperBoost Revolution in Pollination

- Increases pollen foraging on the target crop by 43%.
- Increases pollination activity of non-pollen foragers on the target crop by 54%.
- Increases the number of pollen foraging trips per unit time by up to 72%.
- Increases the number of pollen foragers by up to 150%.
- Increases the number of nectar foragers by up to 150%.

(From manufacturer's sell sheet)

The above claims from the sell sheet targeted at growers may sound a bit implausible if you do the math, especially when you consider that BP encourages workers to remain in the brood nest. However, in an early experiment, Pankiw (1998) found that brood pheromone stimulated pollen foraging by workers. She later (2004) found that synthetic brood pheromone showed promise for increasing bee pollination efficiency in the target crop (cucumber and zucchini). However, for the #1 bee-pollinated crop, data from Dr. Frank Eischen (in prep) ***did not find a substantial pollination effect from using synthetic brood pheromone in colonies during almond pollination*** (since that study, the company has made significant improvements to the design and storage of the device, which could affect the efficacy). The high cost for pollination of almonds will likely generate more trials.

I've seen additional unpublished data from carrot pollination that looks like SuperBoost treatment substantially increased bee visitation. There are other difficult-to-pollinate crops, such as seed onions, kiwi, certain cherries, and in the production of hybrid seed, in which any enhancement of bee visitation would be of value. It remains to be determined in which crops synthetic pheromonal stimulation of rented colonies might be cost effective.

This series of articles on the primer pheromones grew far beyond my initial expectations. I hope that you found the subject to be as fascinating as I did! I truly feel that a good understanding of how the primer pheromones modulate colony dynamics can help each of us to be better practical beekeepers.

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Research Note

A Test of Using Synthetic Pheromones to Initiate Midwinter Broodrearing

by RANDY OLIVER
ScientificBeekeeping.com

Objective: to determine if the addition of either ethyl oleate (EO) or synthetic brood pheromone (BP) to colonies prior to the winter solstice would stimulate broodrearing, with the potential practical application towards producing stronger colonies for almond pollination.

Introduction

The signal for honey bee colonies to initiate midwinter broodrearing is poorly understood. It is critical for colonies to begin broodrearing in advance of good flight weather or pollen flows in order to build up to take advantage of early nectar flows. In addition, midwinter broodrearing is necessary to replace bees lost to natural mortality during the winter. Indeed, some colonies may actually increase their population while completely confined in wintering quarters (Harris 2008 and pers comm)!

Although the lengthening of days after the winter solstice is often cited as the stimulus for the initiation of broodrearing, there is little corroborative evidence that increasing photoperiod is the primary factor, especially since colonies typically initiate broodrearing in late November or early December, at a time when day length is still decreasing (Avitabile 1978 and pers comm; Harris 2008). In fact, colonies will initiate broodrearing even indoors in total darkness!

The winter cluster of bees in cold climates consists almost exclusively of long-lived "winter bees" (Harris 2008), with few bees that could be classified as "foragers." Thus, there would be little forager production of the primer pheromone ethyl oleate (EO), demonstrated by Leoncini, et al (2004) to have the effect of increasing vitellogenin titers in younger bees. Could it be that aging winter bees transition to "forager" physiology so as to fly out of the hive to die? And in the process could they produce enough EO to induce the remaining cluster to initiate broodrearing to produce more workers to take their places? This hypothesis is supported by observations by Higes (2008) that colonies infected with *Nosema ceranae* in winter tended to rear more brood, perhaps as a result of a rapidly "aging" workforce due to parasite infection (Tofilski 2009; Gro Amdam, pers comm).

Opportunity presented itself for a "quick and dirty" test of this hypothesis as the winter solstice approached (and almond pollination drew near). Almonds begin blooming about February 15 in California, and beekeepers are paid a premium for strong colonies at that time. Beekeepers routinely attempt to stimulate midwinter broodrearing by artificial feeding of colonies. There would be considerable interest if a synthetic pheromone could be used to induce colonies to ramp up brood production during the month of December.

Materials and Methods

On December 13, 2009, I moved 30 strong, 2-story colonies from a summer yard in Nevada to the Sierra foothills. They were naturally well provisioned with alfalfa honey and rabbitbrush (*Chrysothamnus* sp.) pollen. The colonies were in winter cluster—any forage had been killed by frost, and temperatures had dropped to near or below freezing each night the previous two weeks.

Figure 1. Placement of the pheromone insert and pollen supplement.

The following day I made an initial check of 14 randomly chosen colonies—8 contained no brood whatsoever; the rest had had only small patches of sealed brood (it was disruptive to the colonies to do the inspection in cold weather, so I stopped after we confirmed that there was little existing brood). All colonies were then given a 1 lb pollen supplement patty between the boxes, and a pheromone insert adjacent to the patty (Fig. 1), with the active side facing up. I also treated the top box with 50 ml of 3.5% oxalic acid in 1:1 sucrose syrup by dribble between the frames of the upper box (for varroa control). The weather for the duration of the trial was cool and rainy, with highs up to 60°F and lows near or below freezing. There was little flight, and no noticeable natural pollen or nectar flow.

The pheromone inserts were specially prepared and donated by Contech Inc. (7572 Progress Way, Delta, British Columbia). Colonies received one of three types of inserts, either ethyl oleate (designed to release 0.4 mg EO per day, roughly equivalent to the total body content of 888,000 foragers (Leoncini 2004) or 63 queens (Keeling 2001); synthetic brood pheromone (SuperBoost®—releasing 0.4 mg per day, equivalent to 660 larval units); or a sham paraffin oil control insert (I was blinded as to type).

After 15 days (December 29) we measured the amount of brood (larvae and sealed) in each colony by the use of a 1 inch wire grid (Fig. 2).

Figure 2. Measuring the amount of brood with a 1-inch wire grid.

Figure 3. Sealed brood present in a colony on December 29, indicating that significant broodrearing took place prior to the winter solstice.

Results

There was considerable variation in the amount of brood in the colonies, ranging from 33 to 205 square inches (a full wall-to-wall frame on one side is 128 in^2). Although all colonies were not checked for initial amount of brood, it was not surprising that those that did have some brood initially had amounts above the mean at the end of the trial.

There were no significant differences between treatments (Table 1).

Discussion

Since there was no apparent difference in the amount of broodrearing due to treatment, the results did not support my hypothesis that winter broodrearing was triggered by production of ethyl oleate by aging bees. Possible factors that could have confounded the results were that the level of EO might have been excessively high (leading to overexposure) or that the horizontal placement of the inserts only allowed contact via the bees' feet, rather than rubbing against their backs (leading to underexposure).

I also tested the effect of synthetic brood pheromone (which also contains ethyl oleate) concurrently, and found that the application of it too did not appear to affect the initiation of broodrearing immediately prior to the winter solstice. This result helps to clarify the temporal window in which the use of synthetic brood pheromone may have practical application, as other studies have shown benefit from its use at other times of the year (Pankiw, et al 2008; Moeri, et al, in prep).

Note that this was only a small trial, and I wouldn't presume it to be definitive. The results with synthetic pheromone applications are variable. Due to the great economical importance of strong colonies for almond pollination, further midwinter trials of synthetic pheromone stimulation would certainly be warranted.

Acknowledgements

I wish to thank Drs. John Borden and Cameron Lait of Contech for their assistance, and Contech for the donation of the inserts and for funding the trial. I also express my gratitude to my son Ian Oliver for his assistance in the field work.

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Treatment	Number of hives	Mean amount of brood	S.D.
Ethyl oleate	6*	99.3	20.4
SuperBoost brood pheromone	11*	92.8	29.6
Control	12	101.1	61.5

* The different number in this group was an inadvertent result of multiple codings and the blinded researcher running short of strong colonies when we scattered the treatments randomly.

** One colony that proved upon inspection to be very weak was excluded.

Table 1. Amount of brood per colony after 15 days of treatment with synthetic pheromones beginning prior to the winter solstice.

A Legacy Blossoms in Vacaville

By THOMAS M. STOCKWELL

Steve Taber and Tom Parisian started Honey Bee Genetics and it's still going strong after 20 years.

Orchards that need pollination surround Honey Bee Genetics

Pheromones of Affection

Tom Parisian pulled up at Honey Bee Genetics in his Suburban wearing a bright yellow storm coat.

Tom Parisian

Colonies in almond orchard for pollination

As soon as he stepped out onto the road he was attracting bees: At first just a stray, then two, then half a dozen. They alighted on his shoulders, buzzed around his waist, and landed on his blue jeans. Was it the bright yellow coat that attracted them? Or was it something else? An aura of bee-ness? A pheromone of affection? He paid them no heed. Already he was eyeing the 4X4 fork lifts in the yard, unloading supplies, talking to Paulino, getting a status report from Rick, approving the paint color for the new shaker boxes for Gustavo and – at the same time – greeting me with a warm handshake.

Anyone who believes that bees do all the work around a bee yard needs to watch Tom and his team. It was a time in Mid-March of 2010 when all the hectic activities of the early spring season were bearing down on this working farm.

Shipping boxes await bees.

For instance, the almond bloom was nearly over, but the almond farmers were calling to ask for just a few more days to have the bees in the orchards. Meanwhile, the prune blossoms were opening, and different farmers in different orchards were calling to ask if the bees could be moved in a little early, *before* their scheduled day.

Simultaneously, there was a construction crew hauling in some final materials for the new bee barn that was being finished. But already the barn was in use. One corner had been made into a woodworking shop where new queen racks were being sawn and new shaker boxes were being painted. In another corner they were unloading and inspecting empty nucleus hives. In a third corner, a 4X4 forklift was moving an entire pallet of drivert bakery sugar, which – in turn — was being distributed into the empty nucleus hives. From the size of this setup and the level of activity, it looked like they were planning to start an awful lot of nucs! I was about to ask

Empty nucleus hives await colonies

how many when Tom's cell phone rang.

It was Sharon, his wife, back at their house. She was busy scheduling the shipping orders for packages and queens. There she was, working out the shipping scheduling for Mid-April when, at that particular moment in the Mid-March, there were still no packages to ship and no queens to sell.

I felt as though I'd landed in the middle of a conjuring act and was about to witness a team of master magicians perform an amazing trick: Assembling new colonies out of thin air. How were they going to pull it off?

That was why I was here. I'd come to witness the great transformation of a working bee farm into the breeding bedroom for disease-resistant colonies of hybrid honey bees.

Honey Bee Genetics

Tom Parisian operates Honey Bee Genetics on about 40 acres of level Sacramento Valley farmland bordered by orchards and the distantly encroaching suburban tracks of Vacaville, California. He keeps about 3500 colonies of bees in continual rotation with the surrounding crops: Almonds and other fruit trees in the early spring and sunflowers in the summer. But pollination and the associated production of honey represent only two parts of his business. It's the third part – genetically selected disease-resistant bees – that have made Honey Bee Genetics synonymous with healthy, productive beekeeping around the world. And the history of this small company runs like a beeline through the science and commerce of modern beekeeping practices.

The Changing Fortunes of Bees

I first became aware of Honey Bee Genetics in the late 1980s when a friend asked me to set her up with bees. I began a remedial investigation about the best bees for our local area: Remedial, because I'd not kept bees for 10 years. I was surprised and discouraged by how much beekeeping had changed in such a short time. Between 1974 and 1984 the whole etiology and treatment of bee diseases had become distorted.[1] What had caused such massive change? Of course, it was the mites: U.S. apiaries were being devastated first by infestations of tracheal (*Acarapis woodi)* and then varroa (*Varroa destructor)* mites. By 1989, varroa mites were wreaking havoc on colonies all across the country.

Most beekeepers were being instructed to use miticides and fumigants to manage the infestations and to save their colonies. But my friend was an organic gardener and the use of insecticides was not an option. Instead, we searched for alternative methods to keep the bees healthy. This quest led me to *Taber's Honey Bee Genetics* in Vacaville, CA. They

Early photo of Taber and Parisian at Honey Bee Genetics

advertised a different approach that didn't include chemical treatment: Bees bred, the ad said, for their resistance to tracheal and varroa mites. And Steve Taber was proving to be one of the most vocal champions of this new approach.

Genesis of Honey Bee Genetics

Steve Taber was already renowned as a USDA bee researcher, lecturer, and author when he retired to Vacaville, California in 1978 with the expressed purpose of raising new lines of hybrid queens that were more resistant to disease.

During that same period, Tom Parisian was working toward a PhD at nearby UC Davis on his own project related to queen rearing. And, in addition, he had his own burgeoning pollination business.

"Back then, pollination was just extra cash – about $6 per colony," Tom told me. "Not much by today's standards. But for a poor grad student with a fair number of hives, it was good money."

Tom's business plan developed from some controversial economic research that questioned if pollination and honey production alone could financially sustain a business in bees. So, he determined to add queen rearing as a third element and discovered that it worked for his business model. From 1980 until 1988 he ran his bee business as *Cal Queens Farm*, based in Vacaville. But then in 1988 a fire destroyed both his home and his bee buildings.

In hindsight, it seems inevitable that Steve and Tom would team up, and the resulting partnership blossomed in 1988 under the business name of *Taber's Honey Bee Genetics*.

"Both Steve and I maintained our breeding lines through instrumental insemination during that time," Tom says. "We were identifying strains that were resistant to tracheal mites, and very few people were doing that. We'd dissect the bees, month after month, using microscopes to examine how they were withstanding the mites. And slowly – very slowly – we started to see signs of resistance in the surviving colonies. Then, we'd cross the queens that showed some resistance with drones from a different strain that also showed promise. And the cycle would repeat. We lost a lot of bees in the process: A very large percentage."

To sustain an appropriately large pool of

Steve Taber

colonies for genetic selection, Tom's acumen as a commercial beekeeper proved crucial. Tom ran the day-to-day operations of the apiary, while Steve attended primarily to the biology of resistance. Honey Bee Genetics expanded to thousands of working colonies actively pollinating the fields and crops near Vacaville. Using this resource of active colonies, Tom and Steve sustained their focus on selecting and breeding disease resistant lines.

"Steve had his own design for nucleus hives." Tom remembers. "I still have some of them around here. They aren't compatible with any other equipment, but that didn't really matter at the time. Steve was happiest just working through his nucleus colonies, while I managed the day-to-day operations."

Then, in 1991, after three years at Honey Bee Genetics, Steve suddenly decided to move to France. It created a quandary for the business, but Tom bought out Steve's partnership, and the company was renamed simply "Honey Bee Genetics."

Yet, in talking with Tom, it was very clear that Honey Bee Genetics had become more than a mere business venture. It had transformed into one of those rare and unique partnerships that — founded and nurtured on professional skills — flourished with a mutual, abiding respect and a deep underlying friendship. That friendship even survived this sudden dissolution of the partnership, and

[1] **"Inheritance of Resistance to *Acarapis woodi* (Acari: Tarsonemidae) in Crosses Between Selected Resistant Russian and Selected Susceptible U.S. Honey Bees (Hymenoptera: Apidae)", Jose´ D. Villa and Thomas E. Rinderer, USDAARS Honey Bee Breeding, Genetics and Physiology Laboratory, 1157 Ben Hur Road, Baton Rouge, LA 70820.**

Tom and Steve remained in frequent contact – across oceans and across continents — until Steve's death in 2008.

Honey Bee Genetics Today

Fast forward 20 years, and Honey Bee Genetics today has become world-famous as a queen breeding organization. They have shipped packages as far west as Guam and as far east as the United Arab Emirates. They've sent hybrid queens to France, Italy, and Chile. The focus on disease resistant colonies has intensified in recent years on survivor stock.

"After Steve left, I used instrumental insemination to maintain and produce breeder queens for the USDA ARS Y-C-1 project[2]," Tom says. "This was our Yugoslavian Carniolan line." But that is not all. "One of our current lines is the Russian Carniolan stock imported by the USDA," Tom continued. "This line has been overwintered in a harsh climate with snow and low temperatures and has been maintained for six years without *any* chemical treatments for mites. We also offer an Italian line which is crossed to the Russian Carniolan drones."

And the results?

"Many of our customers have been repeat customers for many years. These customers — from states all over the country — give us feedback that our bees are surviving and thriving in their apiaries."

The Skilled Team

Today Tom Parisian is running Honey Bee Genetics at a full-tilt pace with a team who has been with him for more than 15 years.

"I don't think I'd still be doing this without the loyalty and the skill of my employees," Tom said. "With Paulino Bustamante, Gustavo Gutierrez, Rick Frech and the rest of the crew doing the day-to-day, and I can actually focus on managing the business."

Indeed, those I met at Honey Bee Genetics were as enthusiastic about their activities as Tom.

But the treat for me as an amateur beekeeper went beyond the opportunity to talk with one of the real pioneers in hybrid queen rearing. It was also the chance to watch his skilled team carefully and efficiently create hundreds of nucleus colonies in a real production setting.

How many nucleus colonies were they making? The goal this season was, according to Tom, 4,000.

Counting, counting, counting

As Tom and his team worked, the first thing I observed was their attention to the phases of the bee reproductive cycle, with an eye on the current weather forecasts and the pollination needs of clients. They clearly have the bee math down pat and are using it as the backbone of their schedule for creating the nucs.

[2] **"Status of pollinators in North America", National Research Council (U.S.), Committee on the Status of Pollinators in North America, Science, 2007, page 78.**

Paulino Bustamante selects the best queen cells.

Each nucleus hive is divided into four sections

Bees in bulk cages await transfer to nucleus hives.

Specially built shaker and bulk cages can hold 35 lbs. of bees.

Each nucleus colony needed a healthy queen and that meant *thousands* of newly hatched bee larva from the best colonies had to be grafted and floated in queen cups containing royal jelly. These queen cups were placed in *finishing hives* where a frame of nurse bees completed the queen cells as the larvae began pupation.

Later, four thousand of the best finished queen cells were chosen from the queen racks for implantation into the nucleus colonies.

This reproductive schedule also dictated that Tom's 1000 nucleus hives – each containing 4 sections — had to be *physically* ready within the twenty-eight day window of pupation. This meant inspecting the 1000 hives, repairing frames, replacing foundations where necessary, and loading the 4000 sections with drivert sugar - no small minor undertaking on an operation of this scale. As a consequence, they stagger the overall hive maintenance work to coincide with multiple cycles of queen rearing and nucleus creation.

Meanwhile, the actual bees needed to fill the nucleus hives were gathered from the colonies that were pollinating in the orchards. Tom's team uses specially constructed funnels, with integrated drone/queen excluders – called "shaker boxes"—that snap into the custom-built bulk bee cages. They *shake* the hives of orchard colonies into these funnels and the bees fall into the bulk cages. Then, the cages were driven back to the farm.

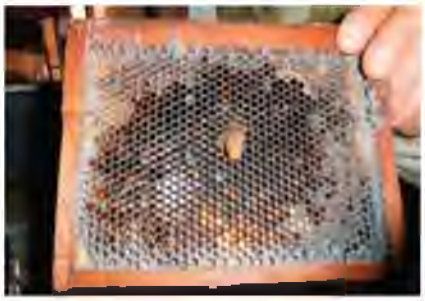
The bulk cages – each holding about 35 pounds of bees — were brought into a cool, darkened shed where the fully prepared nucleus hives have been staged in a single row. The bees were sprayed with sugar water to keep them calm, and the cool Sacramento Valley morning kept them from flying.

Pouring the Nucs

Then, began the process where the reproductive cycle of pupation connected with all the equipment preparation that Tom's team had been working on.

A finished queen cell was pushed into a nuc frame with a single motion. Since there were four sections in each hive box, four queens cells were added to four frames per hive body.

At the same time a team member was grafting the queens onto the frames, another member was following close behind with a metal handleless ladle, carefully scooping bees from the bulk cages and literally "pouring" the bees directly into each section. A third member placed burlap inner covers over the top of the four sections, and then laid the exterior cover on the completed nucleus hive.



Queen cell inserted into nucleus frame

1,000 nucleus hives in fields at Honey Bee Genetics

Bees are hand-poured into nucleus hives

As each layer of completed nucleus hives was closed up, a new layer of empty nucs was set directly on top, and the process was repeated.

By the end of the morning, several hundred nucleus hives were assembled by this operation, each containing four colonies.

The whole operation was a masterpiece of timing, coordination, and skill. Watching them handle these colonies with such grace and speed, I was awed by the care they demonstrated with each nuc. These were not some hired-hand day laborers, but each a truly skilled and dedicated beekeeper. They performed this operation in almost complete silence as a few wayward bees circled the stacks. It was like witnessing a team of midwives attending a birth: The creation of new life in the world.

They left the nucs in the dark for two days to allow the colonies to settle in and the queens to emerge. Then, they moved them out into an open bee yard. Within several days, the queen in each colony would fly out on her mating flight. When she returned, she would begin laying her first eggs, building up the nuc colonies.

Catching the Queens in April

On my fourth visit to Honey Bee Genetics I rode out with Tom to visit the nucleus farm – the 1000 hives now nestled in an open agricultural field. Two team members were inspecting the colonies to make certain the emerged/mated queens were adequately laying a good pattern of eggs. Then, they harvested the queens and carefully slipped them into their queen cages. Watching them work in the field, as a couple of Thoroughbreds wandered in an adjoining paddock, there was almost a festive atmosphere: The sun was out, it was nearly 70, and it seemed a perfect

Harvesting queens

Ensuring queens are laying

Marking queens

Packages poured

California day for searching for queens. Meanwhile, back at the office, these queens were gingerly marked by Paulino — in preparation for individual shipping or as the queens to shipped with bee packages.

The packages, themselves, were also being assembled. Crew members drove out again with the bulk cages, shaking the active colonies to gather workers, and pouring them into shipping boxes where a queen awaited with a can of feeding syrup for their journey to their new homes.

Shipping and Pickup

On April 17th, almost precisely one month from my first visit in March, Tom asked me to drive over one more time to the apiary in Vacaville. His wife Sharon's meticulous scheduling had already shipped thousands of bees as far north as Alaska, and as far east as Ohio, and their entire stock of packages—pre-ordered by individual telephone calls and emails —had been sold out for several weeks. Yet the telephone calls were still coming.

Some calls were from customers who had forgotten to order their bees, and now were disappointed. Some were about obtaining new queens. Most were from people needing some help with the installation. One call from an airport shipper in Washington reported that a forklift truck had pierced through a pallet of bees headed for Alaska. Fortunately, Tom found a local beekeeper to patch the shipment and it reached its destination. The frantic calls, Tom said, probably wouldn't let up until June when the installation season ended.

The conjuring trick was now nearly complete: From out of thin air Honey Bee Genetics had sent another generation of disease

Package bee pick-up day at Honey Bee Genetics

(above) Tom Parisian makes sure customers know how to install their package of bees (r) Future beekeeper on bee pick-up day listens to installation demo.

resistant bees out into the world.

The Future at Honey Bee Genetics

Still, Tom had one more special thing he wanted to share.

Each year, on three weekends, he invites the amateur beekeepers to drive out to the apiary and personally pick up their packages. Forty people had already come through that morning by the time I arrived at 9AM, and some had driven in from as far as Mill Valley, two hours away. Several had come with their children and their grandchildren. Others brought their spouse or neighbor to share this unique experience. I asked each how they had found Honey Bee Genetics, and each described a personal past connection to the company.

Then, Tom took each little group over to a table where he offered instructions on the best strategy for installing their packages.

One young beekeeper stared wide-eyed, looking for assurances from his grandfather. Another stood by, silently tracking a few stray bees as his father asked detailed questions. Tom spoke softly, authoritatively, showing a knack for filling in when a questioner seemed hesitant or uncertain. Then, one by one, Tom led each family to its precious package, and soon the morning pickups were complete.

Finally, we pulled up a couple of empty supers and we sat outside in the beautiful California sunshine and talked about all I had seen. As we talked, bees from the finishing nucs strayed over and carelessly circled around his shoulders. Soon we were discussing a wide range of topics: About Colony Collapse Disorder; about the new pesticides in agribusiness; and about the amateur interest in bees. Finally, I asked how the Honey Bee Genetics of today had changed, and how the change related to the original goals that he and Steve Taber had set out more than 20 years before.

"Our vision has always been on customer service," he said. "We do that by supplying the highest quality bees and bee products, and assisting the farmers in improving their crops by supplying them with strong, healthy bee hives."

These were the precise elements of Tom's business plan from more than 20 years earlier: Pollination, bee products, and genetics. It was a great response to hear from the owner of this small company: A true commitment to quality and customer satisfaction.

Beyond the Business Vision

But as an amateur beekeeper who had visited the apiary, and had witnessed how its bees performed over 20 years, I had my own personal vision of Honey Bee Genetics, and it seemed to stretch a bit further beyond the basic business model. And this same vision seemed to be reinforced by every beekeeper I met there that morning.

When colonies were being devastated by the new organic challenges of tracheal mites and varroa, Steve Taber and Tom Parisian charted a new direction for managing bees. They saw that chemical management of pests was as hard on bees as it was expensive for beekeepers. They seemed to understand that it was the adaptive biology of *Apis mellifera* that held the key to its own survival, and that treating the bees with chemicals actually retarded the long-term chances of the species' survival.

It was this sort of vision that created the enterprise of Honey Bee Genetics. Steve Taber and Tom Parisian – along with a few others organizations – had set up a chemical-free breeding refuge for the species to work out its own fate. This fate included hybridization, but it also relied upon reproductive adaptation—the propagation of survival strains—over years of careful and skilled professional management.

Tom Parisian inspects the brood pattern on a nucleus frame

I wonder if this is the true legacy that Steve Taber and Tom Parisian will one day leave behind, and the reason Honey Bee Genetics will continue to thrive in the years to come.

Which is the true vision and future of this small and dedicated company? The business model or the scientific biological insight into this species called *Apis mellifera*?

As Tom took off on his next errand of the day, I watched as yet another handful of bees swirled around his shoulders. With a bit of imagination, one might believe they were whispering in his ear.

Beekeeping Along the Ho Chi Minh Trail in Laos

By Stephen Petersen
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In Eva Crane's book "The World History of Beekeeping and Honey Hunting" she describes "purpose-made cavities" employed by* cerana *beekeepers in the remote eastern areas of Xékong Province in southern Laos (Crane 1999). Even though it was Christmas, I had to find it… not as easy as it might sound.

Hombre prevenido, nunca fue vencido.

As my Cuban friends once explained to me, a rough translation of this would be the "*Forewarned is forearmed*" expression we have in English or, as my sisters are fond of saying, "*Nyah, nyah, I told you so*!"

These thoughts crept into my mind as I crossed the Xekong River with my rented motorbike astride a pallet lashed to two dugout canoes. I couldn't find anyone who wanted to spend Christmas as I often do – back-of-beyond in whoop-whoop land. I was on my own; no, I didn't top off my fuel tank, nor did I have a spare tire, neither did I have a map other than one of southern Laos passed out at guesthouses. But, I've got an outgoing manner, I'm not afraid to make a fool of myself and I *needed* to find those tree beekeepers I'd heard about. "*After all,*" I mused, "*it's only 115 kms, I'll find gas along the way and I'm sure I can find a place to stay.*"

Neither words nor pictures can describe the condition of the "road"- let it suffice to say that it took me eight-and-a-half hours to go the 115 kms; that's 13.5 kms/hr or about eight miles per hour. The locals do it in much better time, but I was careful for several reasons – it was a rented bike and they had my passport as deposit; I didn't know how to say "*Help I've fallen and can't get up*" in Laos; and who wants to be stuck in the middle of whoop-whoop land on Christmas (or any other day). There were several alterations to the road courtesy of the American Air Force during the Vietnam War – this was part of the infamous Ho Chi Minh Trail. I will give a 4-star rating to the Honda motorcycle company—my little 100 cc Honda Wave rode through river crossings with water over the engine, climbed hills that I couldn't believe, and all with 100 kilos of beekeeper on board. I dumped it twice; hit several rocks (*"Oh! My God, what if I break the engine oil pan!*") hard enough to bend a foot peg, skinned my knee, banged my head (but was wearing a helmet) and tore my pants. We're having fun now!

Flame of the forest – Although it is not common, *Butea monosperma* produces copious nectar.

Nests of the Giant Asian Honeybee (*Apis dorsata*) festoon the branches of a kapok tree (*Bombax ceiba*).

Beautifully carved hand-hewn timbers support this Alak family home as they pose on their front porch in Ban Pah-Awh.

A hand-made vase depicting everyday scenes claimed by the owners to be more than 200 years old; used for brewing "lao-hai", the local rice wine.

A view of the Annamite Mountains – Laos is extremely rugged and the road system is slowly being upgraded.

Bad "road" conditions slowed my progress to about 8 mph.

Purpose-made cavity for attracting swarms of *cerana* bees. The entrance is closed with a slab of wood or rock; a small rock restricts the entrance size.

With the wooden slab removed you can see the bottom edge of a few honey combs.

If I wasn't so nuts about bees, I'd probably want to grow up to become an anthropologist – seeing how people live and interact with their environment is one of the highlights of my travels. I'd pulled into Ban Pa-awh, an Alak village, attracted by the fantastic architecture of the houses. The Alak are members of the Mon-Khmer linguistic group who have inhabited the region for thousands of years. The whole of the Annamite Mountain chain is their domain; in Cambodia the Mon-Khmer groups are collectively known as "chunchiet", in Vietnam they're the "montagnards", and here in Lao they're the "Lao Sun"(pronounced soon). In Xekong province there are more than 14 ethnic groups.

The Pa-awh village communal houses (I understood the extended family lives in the same house) are very large – at least 10 meters (33 feet) long and 6 (19 feet) wide, they're raised off the ground about 1.5 meters and are accessed by a notched log. There is a "porch" that is covered by the encompassing thatch roof. The thatch is astonishingly thick - at least 30 centimeters (12 inches) - smoke from the interior hearth fires turns the thatch a rich ebony hue on the inside and keeps insect damage and rot down to a minimum. Above the porch is a gable end that is beautifully carved in what I would imagine is a stylized water-buffalo design.

On my own, my interviews with "informants" (I remember that term from anthropology classes at University), consists of my showing bee-related photos for which I've established a routine set of phrases and questions in several languages. Only a few people in the village spoke Lao, so there was a lot of arm waving, gesticulating, arguing, and excitement which I took to mean "*Yes, there are these wild bees in the forest and we get honey from them, but there is no beekeeping here.*" To which I could only reply, "*Eueuh*" a sound common in SE Asia denoting assent, much like our "*Unhuh*".

I was invited for a toke on the lao-hai (rice-wine jugs) stewing away in the dark recesses of the hut, but I pantomimed driving my moto off a cliff to get the "**Please don't drink and drive**" message across. I took a few family photo shots, got the heebie-jeebies looking at the cobweb-festooned buffalo skulls staring down from above, and took my leave.

With all this motoring in first and second gear my gas gauge was creeping past the less-than-half mark; I tanked up with a liter for $1.80 which, if you do the math, works out to $5 plus /gallon. I wasn't a bit worried about the used whiskey bottle it came in; it was the 3-4 fellows with lit cigarettes clamoring around for a look-see at the foreigner by himself on a motorbike in whoop-whoop land. There was perhaps 4 ounces of petrol left in one bottle after topping me off – the young lady offered to put it in a plastic bag for me; after all, I'd paid for it. "*Bo pen yang* (no problem)" I said, declining her offer.

It was cold when I got to Dakcheung – and almost dark. The *Lonely Planet* has never made it this far, I'd have to find a guesthouse or ingratiate myself with a local family (*Hi! I'm from America – remember the country that bombed the crap outta this place, maybe I can sleep here tonight?*"). It was either that or turn around and head out of town a few kms to put up my hammock and spend the night freezin' my rear. "*Ani ban pak baw*? Is there a guesthouse here?", was the query I put to several young folks. The response was always "*Bo mi* – don't have".

This response brought back recollections of historical material I'd been reading concerning travels in Laos by various European explorers in the mid-to-late 1800's. They all groused about the expression "*Bo mi*", which seemed to be the reply they frequently received regarding most of their inquiries. "*I finally lost my patience and thrashed the village headman soundly until he relinquished to my demands for elephants,*" writes one explorer.

Finally, a bright young man spoke to me in English- "*Hello, How are you? What is your name? Where you come from? Do you like Lao? How old are you?*" I answered this common Asian litany for about three minutes before I could ask if there was a guesthouse in the village - I even used the proper Asian pronunciation "*Guess how*". This drew a blank. I repeated the question in Lao miming sleeping as in the reclining Buddha. "*Die, die* (have, have)" was his reply. Upon my asking, "*U sai*? (Where?)" he waved in the general direction of Vietnam (just 25 kms along the same road) "*Over there.*" Mmmmm... I started up the moto and puttered in the direction of his desultory hand waving – it was moments from being really dark in a town with no electricity. I spotted a two-story structure with a group of men and a SUV parked in front looking as though it had been on a trip of some sort. I addressed the group in Laos and they responded – barely. It turns out that, yes, this was the guest house and they were a bunch of Vietnamese who had come over to look at "forest production". I took this to be some sort of euphemism for illegal logging. A couple of them were cooking dinner and one young fellow spoke a bit of English. I couldn't be choosey; I hoped they were joking when they said they would charge $100/night… yeah, right!

There was an outdoor faucet with very cold water where I could wash the mud from my trip off – no heat in town so I had to look at photos of Alaska to keep warm. Dinner was less than spectacular—in true Asian fashion they started chopping at the head of the chicken they'd bought and ended with the claws; throwing the lot into the pot. I managed a small bowl of rice with some of the juice, but could not handle the bird. I was exhausted and soon fell asleep under a

Mr. Chanthavieay (a Talieng beekeeper) leans a forked branch against the tree to access his colony about 12 feet from the ground.

A colony of *Apis cerana* has taken up residence in this log box; another colony can be seen toward the rear. The box is under the eaves of the house.

A closer look at the *cerana* colony- yields are low from *cerana*; 2-5 pounds per season is the norm.

massive pile of blankets; my body heat would dry my wet pants.

I awoke around midnight to the patter of rain on the roof. I recalled the words of the UXO (Unexploded Ordinance) personnel back in Xékong, "*The road is very bad, if it rains it is impassable.*" *"Great,"* I thought to myself, *"it could take three days to get back."* I tried to shut out the sound and go back to sleep. No such luck. By 6AM the Vietnamese were up and about with the customary hacking, coughing, and spitting of smokers on a camping trip in the cold. A cup of strong Vietnamese coffee soon banished all wooly thoughts from my head; I was ready to face the next challenge – "*Kasikam pa mai u sai baw?* Where is the District Department of Agriculture and Forestry (DAFO)?"

More general hand waving in several directions; I drove up and down the main (and only) road chanting my mantra, getting closer with each question until word evidently reached the office that a foreigner was in town looking for DAFO and a young man waved me down. He spoke to me in English!

I explained my purpose for being here and was introduced to the DAFO director; some negotiations followed and my new found friend, Mr. Boualavong, was given the day off to guide me around provided I paid his daily wage – $2.50. Word travels fast in the villages; soon the village school teacher, who also spoke a bit of English, showed up wanting to tag along. It was a school day so I had to come up with another $2.50 for his salary – I didn't want to know what the kids would do with no teacher for the day. I filled the fuel tank on their motorbike – another $5, and we were off for a beekeeping adventure.

I was immediately glad I'd hired the teacher, Mr. Sakmon, as he spoke Talieng, one of the dialects of the Lao Sun in this area. I was even happier that I had a jacket – we were at 1500 meters (about 4700 feet elevation), it was still drizzling, the clouds were scudding across the hills periodically enveloping us in mist, and my Alaska blood had thinned substantially in the last two months.

The rain had made the trails across the laterite hills as slick as ice. Boualavong and Sakmon dumped their bike three times; I managed to get away with just one spill. We wound around the hills, up and down, in and out of the mist; I was completely disoriented, finally ending up in the Talieng village of Ban Dakleung where a Mr. Chanthavieay offered to show us his bee trees. Success at last!

Eva Crane, the grand-dame of beekeeping lore, describes what she calls "*purpose-made cavity beekeeping*" in her book "*The World History of Beekeeping and Honey Hunting*". It is a cogent description. As far as I can tell from exhaustive literature research, this style of beekeeping is unique in this part of Asia. Only the Talieng in a handful of villages in the Dakcheung district of Xékong Province keep bees in this manner. Dorothy Galton in her book, "*A Thousand Years of Beekeeping in Russia*" (Galton 1971) describes a similar practice by Russian "*bortniks*" (tree beekeepers). A recent ABJ article has some wonderful pictures of the tradition still practiced in the Bashkir Region of Russia (McNeil 2009).

A cavity is hewn in a healthy tree anywhere from ground level to 3-4 meters above the ground; the trees I observed were called "*mai mak kaw*" and "*mai champapa*" in Lao – I wasn't able to come up with a scientific name. The opening is perhaps 10-15 centimeters (4-6") wide and 20-30 centimeters high. The cavity appears to be then enlarged by building a small fire (lack of translation here; just my personal observations) inside and thereby expanding the cavity upward. Most of the charred wood is scraped out and another piece of wood shaped to fit the access hole. This is not a tight fit; the bees have to have a small gap to access the cavity and the beekeeper must be able to remove it to harvest honey.

We trekked about two kilometers through the forest to find a tree that had an active colony. I couldn't help but notice the numerous bomb craters – we must have passed a dozen in the short walk. Our Talieng beekeeper, Mr. Chanthavieay, leaned a three-meter long, 10 centimeter diameter, forked branch with several notches cut into it for steps against the tree and scrambled up. A few knocks and a dynamo hum indicated there were bees in the cavity; I shot a few photos as he removed the "door". We could see the bottom edges of three combs; Mr. Sakmon reached up into the cavity and removed a piece of comb and passed it down to me. I fumbled with a sample jar for collecting bee specimens for Deborah Smith at the University of Kansas, a small jar of alcohol for preserving the bees, my camera, the bee comb and sticky fingers. I got a half-dozen bees into the sample jar, took a few bites of comb (brood, pollen and honey) and took a few more sticky fingered photographs. Now we're really having fun!

Back in the village of Ban Dakleung we sat in the family home and discussed "*krāt*" the local term for *Apis cerana*. At this altitude and this time of year (late December) there are not too many bees – it's too cold. During the months of April and May, when the temperatures warm, the *cerana* bees migrate up from lower elevations. I asked where they were now. The villagers rattled off the names of three more villages—Ban Gailo, Ban Dtanyueng, and Ban Dtanbrone—located at lower elevations where there were "many" tree beekeepers. My enthusiasm for visiting these villages on this trip waned when I found they were a 30 kilometer hike from the nearest access by motorbike.

There is no true "beekeeping" in the management sense with the tree cavity beekeepers – this method simply allows easier access for harvesting the colony. "Ownership" of the colony is established by making a personalized mark on the tree or tying a vine around the tree—tree tenure is respected within the community. When they harvest, they take the whole nest – honey, pollen and brood; the bees abscond soon thereafter. Yields are low, 2-3 liters of honey is considered a good harvest. All the honey is locally consumed as there are no established market channels and prices are low; honey from *dorsata* bees averaged about

Fresh honey is always a treat, especially when only the foreigner got stung while harvesting. Left to right - local village beekeeper and my two translators Mr. Sakmon & Mr. Boualavong.

The Talieng ritually sacrifice buffalo for important occasions – sleeping on the floor of this hut below the skulls made for some interesting dreams.

Honey is normally sold in recycled one-liter whiskey bottles. High moisture and pollen contamination cause fermentation within weeks.

$2.50 kilo when I could find it in markets. It is often fermenting and presented in used whiskey bottles with no labeling. I bought a small amount (about 6 ounces) only to find out it had hundreds of ants in the honey (after I put on my glasses!).

While we discussed the bees my eyes wandered around the thatched hut; in one corner were a series of glazed jars containing "*lao-hai*" the local rice wine. One beautiful jar caught my attention; it was decorated with scenes from everyday Talieng life – two hunters were carrying a deer, another sat smoking a pipe near a rattan basket, while in the background loomed a high-pitched roof of the traditional Talieng-style house. I asked about the jar and where it was made. They claimed it was over two-hundred years old, locally produced, but that they did not make them anymore. I was also told how "bad people" had stolen most of the jars for sale in antique markets – it was a beautiful work of art and a tradition on its way to extinction.

Another amazing feature was the dozens of water buffalo skulls adorning the eaves of the house. These guys are into buffalos – they are ritually slaughtered for important events. Great quantities of alcohol are consumed, there is singing and dancing and they eat the buffalo. Evidently my arrival was not cosmic enough to warrant a sacrifice, but the apex of the gable end was decorated with at least 20-25 buffalo skulls as evidence of their spiritual (the Talieng are animists) and cultural importance.

The author stands alongside a SAM (Surface to Air Missile) complete with Russian and Vietnamese stenciled writing on the sides. It was probably shipped into Haiphong (North Vietnam) disassembled, carried down the Ho Chi Minh Trail, reassembled by Vietnamese technicians, but thank goodness never got a chance to shoot down an American jet.

I had one of those light sticks that you snap and it glows for 12+ hours – they are always a big thrill in villages with no power – I wondered how they would react to a glowing buffalo skull. A sense of cultural propriety kept me from waving around some 21st century technology – I didn't want to offend any spirits that might be lurking about.

In true Petersen fashion I was down to the last few kip (local money)—I needed to get to a bank or someplace where I could change some money. I spent the night on Boualavongs' floor to save the $3.50 the guest house would have cost me. I needed every last kip to pay for fuel and the 50¢ ferry ride back across the Xekong River. I topped off the little Honda's gas tank and spent another nerve-wracking 7 hours making my way back to civilization (no lolly-gagging on the return trip) wondering about flat tires, broken chains, or water flooded engines. I felt a giant weight shift from my shoulders as I rolled up on the pallet spanning the two dugout canoes to cross the Xekong.

Home at last, home at last, thank God almighty we're home at last. *Ego apis ergo sum.*

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Cranberry

Cranberry

Scientific name: *Vaccinium macrocarpon*

Synonyms: *Oxycoccus macrocarpus*

Origin: Northeastern North America

Plant description: Cranberry is an evergreen or semievergreen creeping, mat-forming, freely rooting trailing vine, that spreads to about 3 ft across and sends up numerous vertical branches known in the trade as uprights that reach heights of 6 to 18 inches. Both the trailing vines and the uprights have leaves, but only the uprights produce fruit[11]. The oblong, elliptic leaves range in length from about 0.33 to 0.75 inches and are somewhat whitish beneath. The usual 5-6 flowers per upright range between 0.25 and 0.33 inches in length and are arranged in small lateral clusters. At first the blossoms are white, but if not pollinated remain on the upright and become a rosy pink. The stamens fit tightly together and form a tube around the pistil. At first the stigma is retained within the staminal tube, but as the style lengthens, it is pushed through the opening at the free end of the tube. The pollen from each stamen is released through a small opening called a pore that is located at the stamen's terminal end. The nectaries are found surrounding the style just inside the ring stamens. The flowers hang with the tips of the stamens pointed downward and the petals curved upward. Some think the flower in silhouette resembles the neck and head of a crane. The species was originally called craneberry and subsequently shortened to cranberry. The roundish red fruits range in diameter from about 0.25 to 0.75 inches[16 &21].

Distribution: In the wild, cranberry is found in acid bogs and swamps with a pH generally between about 3.2 and 4.5[16]. In the US, the states in order of descending production are WI, MA, NJ, OR, WA[33]. In Canada, the major provincial production occurs in British Columbia. Other areas of Canadian production occur in Quebec, New Brunswick, Nova Scotia and Prince Edward Island[34].

***Vaccinium macrocarpon* flowers. Photo taken at DeGrandchamp Farms near South Haven, MI on 6/15/2006. To ensure good pollination the grower purchases commercial bumblebee colonies (quads). Honey bees on this farm seem to desert cranberry in favor of more productive bee forages found in the area.**

Blooming period: In Massachusetts the plant blooms in late June and early July and the fruit ripens in September and October[11]. In Oregon, Wisconsin, and British Columbia the species generally blooms during June and July[35].

Importance as a honey plant: While honey is sometimes obtained from cranberry, it is not a major honey producer, but see below under 'Honey'. Ayers and Harman[1] found the species to be listed as a source of commercial pollination in WA, OR, WI, NJ, and MA and in the Canadian provinces of BC and NB.

Honey potential: Shaw et al[24] found that the nectar sugar concentration of cranberry varied between 38 and 62 %. The concentration tended to increase as the daily temperature rose. They also found concentration differences between the three cultivars with which they worked. The variety MacFarlin produced a lower average nectar sugar concentration (45.7%) than either Howes (50.2%) or Early

Table 1. Characteristics of cranberry honey[31]		
Characteristic	Sample 1	Sample 2
Color	Light half of light amber, Pfund=50-70 mm	Dark half of light amber, Pfund=70-85
Granulation	Few Scattered crystals	No crystals
Moisture (%)	17.4	17
Age (months)	16	15
Fructose (%)	36.29	34.89
Glucose (%)	29.42	26.84
Sucrose (2)	0.87	1.17
Maltose (%)	7.36	8.69
Higher sugars (%)	2.48	3.41

Black (54.7%). Singh[27] in India, found the sugar concentration of cranberry nectar ranged between 16 and 51%.

Honey: Irving Sibert[26] describes cranberry honey obtained by Justin Caswell (an early cranberry pollinator) as, "The honey is reddish in hue and has a spicy flavor. I think it is as good as any I've ever tasted and it has a flavor all its own." He quotes Caswell as, "Folks pretty near stand at the extractor waiting to buy it." Caswell himself states, "Honey from cranberry is a light to medium red, of mild flavor and not as sweet to the taste as some honeys[3]." Gates[13] (1918) stated that cranberry produces a superior honey. McGregor[21] also reports that cranberry growers sometimes produce a reddish honey they associate with cranberry. White[31] analyzed two quite similar cranberry honeys that were submitted by different beekeepers located in Eastern Massachusetts (See table 1).

Pollen: Shimanuki et al.[25] describe separating cranberry pollen from other pollens in pollen traps that came from hives near a cranberry bog based on its "yellowish brown color".

Additional Information:

Early history of the American cranberry industry

The American cranberry industry initially started along the Cape Cod and New Jersey coasts in about the 1830s to provide sailors sailing out of Boston, New York and Philadelphia with a long-lasting food supplement that prevented the disease scurvy that caused devastating health problems to sailors of the day[28]. Today we know that the active agent was, of course, vitamin C.

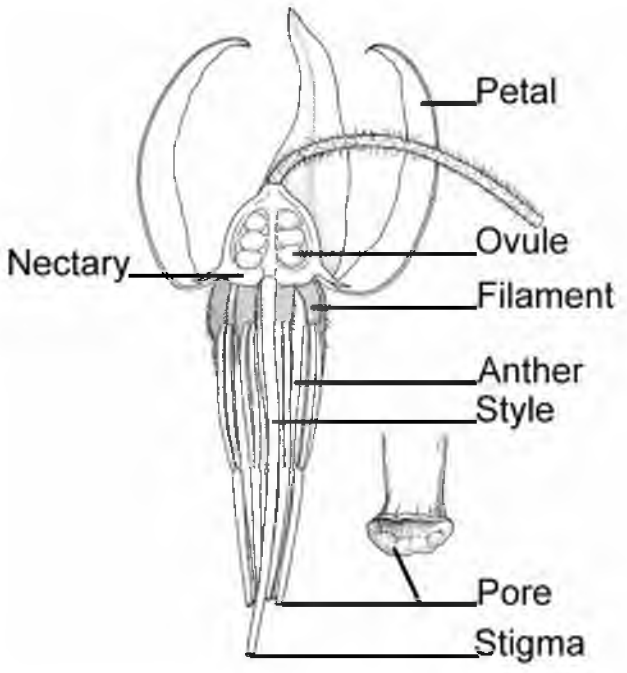

Illustration of a cranberry flower. This illustration is intended to supplement 'How the flowers and bees function' found in the text. Adapted from McGregor[21]

How the flower and bees function

Roberts and Struckmeyer[22], working in 1942 in Wisconsin, stated that the bee did not touch the stigma when visiting cranberry and, therefore, pollination resulted from a combination of the bee jarring the flower and dispersing the pollen into the air, which the wind then distributed to mature stigmas. They presented a small amount of data that suggested brushing the uprights with a "stick or paddle" increased berry set (their table 2). As a result of this assertion there were cranberry growers in Wisconsin who actually dragged heavy ropes over their plants to simulate these actions. These ideas have largely been discarded today, and there is now considerable evidence that insects, especially bees of various types, are largely responsible for pollination[18]. When the flower opens, the style is slightly shorter than the ring of stamens in which it is encased. About a day before the style lengthens and the stigma is pushed out of the staminal tube, the anthers release their pollen through the openings (pores) at the end of each stamen. When the pollen is shed, the stigma is dry. The stigma remains unreceptive for about 24 to 36 hrs after the anthers initiate their pollen release. By this time the style has lengthened to place its now moist, sticky and receptive stigma about 1/16 inch below the openings of the now empty anthers[21]. It is now conceded that the pollen is not windblown and is not likely to come in contact with its own receptive stigma. The pollen grain is made up of four pieces (a tetrad), each capable of germinating into a pollen tube and fertilizing an ovule and, therefore, relatively small amounts of pollen are needed to fully pollinate the flower[22].

When a bee probes an early stage flower (before the stigma is receptive), the pollen falls out through the anther pores onto the bee's body[12]. When the bee then moves to a more advanced flower, it transfers that pollen to the now moist, sticky, and receptive stigma, causing cross pollination. Cranberry thus appears to be designed to facilitate (perhaps force is a more appropriate word) cross-pollination. After a flower is pollinated, it sheds its petals and initiates fruit development. If the flower is not pollinated, it persists for some time on the plant and the petals turn a rosy color. A high incidence of rosy colored flowers is one of the keys to identifying inadequate pollination[21], but see the discussion below about blasting.

In addition to facilitating fruit-set, bees also help increase the size and uniformity of the berry. Each cranberry consists of four basic female units (carpels) which contain several ovules, each capable of developing into a seed if fertilized. Filmer et al. [9], using four different cranberry varieties, demonstrated quite convincingly that berry size is positively correlated with the number of seeds/berry. In addition to being small, berries with low seed numbers are also often misshapen.

Which bees are the best pollinators?

Originally, as the cranberry industry developed along the North American East Coast, native pollinator populations were apparently adequate for the pollination of cranberry bogs. In a 1914 extensive report on cranberry research[10], under the subheading 'Blossom Pollination', while there is a clear indication that the author was aware of "bees" being important in setting cranberry fruit, the words "honey bee" aren't mentioned. In 1940, a time when Massachusetts was claimed to produce more than half of the world's cranberries, another extensive report entitled 'Cranberry Growing in Massachusetts' doesn't seem to mention pollination at all, much less honey bees. It is as though pollination just magically occurred, and under the environmental conditions of the day that provided adequate native bee populations for pollination, that's probably about the way it appeared.

Today native bees frequently aren't available in sufficient populations to effect good cranberry pollination. As an example, Winston and Graf[32] found the native bee populations in The Fraser Valley of British Columbia to be very low and insufficient for pollination of several types of berries, including cranberry. The reasons appeared to include: pesticide impact, habitat destruction, competition with managed honey bees and an extended rainy period during the spring

in which the study was done, which may have washed out nesting sites[1]. In addition to these reasons, there are numerous suggestions in the literature that as civilization encroaches on cranberry bogs, there are other reasons that the soil-nesting habitat of bumble bees is deteriorated (soil compaction, pavement, shifts in vegetation type, etc.). As it became clear that native pollinator populations were diminishing to the point that it was adversely affecting cranberry pollination, the interest in honey bees for cranberry pollination grew. I find ironic, that as early as 1925 Ray Hutson, one of the early proponents of honey bee pollination of cranberry, pointed out that there were many native pollinators available in cranberry bogs, which he attributed to the undisturbed space surrounding the bogs that he called "**waste land**"[14].

In reality, honey bees are not very fond of cranberry, and on a bee per bee basis, honey bees are not nearly as effective as bumblebees for cranberry pollination (see 'pollination recommendations' below). Cranberry produces only small amounts of nectar, sometimes almost none, and is also frequently considered to be at best a marginal pollen producer[2][4 & 17]. When compared to bumble bees, the main advantage of honey bees is that they are relatively easy to manage. Overnight the cranberry grower can have multiple hives of honey bees delivered, each of which may have a larger population than the total population of local native pollinators. While honey bees are not the best cranberry pollinators, there is considerable evidence that they can, under the right circumstances, effect good cranberry pollination. As early as 1925, Ray Hutson[14] , working in New Jersey, caged equal areas of a cranberry bog with and without bees. In the cage with bees there were 2385 flowers that produced 1335 berries (a 56% set), while in the cage without bees, 2184 flowers produced 185 berries (an 8.5% set). In 1947 Farrar and Bain[5 & 6] in Wisconsin found only 10 berries/ft^2 from caged plants without bees, 124 berries/ft^2 from open pollinated plants (no cages)[3] and 171 berries/ft^2 from plants caged with bees. Filmer and Doehlert[7 & 8] reported unreferenced New Jersey cranberry research, which was apparently designed to refute the Roberts and Struckmeyer work described above. This New Jersey research produced only 15 cranberries/ ft^2 in cages where bees were excluded, even though the vines were agitated daily by various means to dislodge pollen. In comparison, 90 to 152 berries/ ft^2 were produced in adjacent uncaged plots where apparently pollinators were plentiful.

Even when honey bees are plentiful, they don't always do a good job of cranberry pollination. Kevan et al.[15], for example, in 1983, working in Ontario, studied the effect of honey bees on pollination using the relationship between distance from the hive and fruit set[4]. These researchers found no significant differences between distance from the hives in either fruits/flower, and seeds/flower even though honey bee populations did decrease with distance from the hives. Even near the hives, however, the population of foraging honey bees was not high. There were, however, apparently relatively large populations of bumble bees in the area. It is clear that cranberries are not very attractive to honey bees, and if they have another and better foraging choice, they will take advantage of it. In this study it appeared that the honey bees were working more attractive plants in the area, and when it came to cranberry pollination, they were leaving the heavy lifting to the bumble bees. Ironically, if for some reason that particular year, the area surrounding the bog hadn't supported bumble bee populations, that space, so important to maintaining bumblebee populations, might well have turned around and "bitten" the cranberry grower.

Marucci (1967)[17], reviewing some of the New Jersey research, reported even strong honey bee colonies did not do much pollinating until about the 7th to 10th day after cranberry had started blooming. In part this was again because there were numerous competing higher quality forages in the area that were terminating bloom just as cranberry began to bloom. In this review, the author describes some of his unpublished data where he had manipulated small cages in a cranberry bog to study the effect of various pollinator exclusion periods on berry production. He found that the percentage fruit formation was not reduced by one or two or even sometimes three weeks of pollinator exclusion, if one week of unhampered foraging had been allowed during peak bloom. If, however, the one week uncaged period occurred at the beginning of bloom, fruit set was greatly reduced[17].

The work of Shimanuki et al.[25] suggests that bees should be moved into the cranberry bog before the peak of bloom. In this work, three hives were moved into cranberry approximately one week before peak bloom, and another three hives were placed there at peak bloom. The hives placed there before peak bloom produced 87.9 grams of cranberry pollen (74.25% of pollen collected) versus 15.77 grams of cranberry pollen (20.94% of pollen collected) by those moved into the bog at peak bloom. Notice that this may seem a little different than the pollination advice that is sometimes given, i.e., that bees should not be moved to a pollination site too early or they may become "addicted" to the surrounding bee forage and continue to work it instead of the crop for which they were intended. While this may seem different, it may not be, given the relatively long blooming period of cranberry, which is about 4 weeks[17].

Blasts

As described above, unlike other deciduous fruits, unpollinated cranberry flowers remain on the plant and turn a rosy red. In this condition they are called "blasts". Generally many blasts can be seen in a cranberry bog, and are frequently of concern to the cranberry grower. Marucci and Filmer[20] compared fruit set on cranberries caged with a hive of bees, which they considered represented an overabundance of bees, versus uncaged plants exposed to a honeybee population of one hive/acre. The caged plants with bees did not set a higher percentage of fruit than the uncaged plants. In their experiments they also pruned flowers from uprights and counted the subsequent number of blasts. Pruning reduced the number of blasts and gave a higher percentage of flowers that produced fruit. They also noted that "pruning of florets" by frosts gave the same result. Their final conclusion was that an insufficient number of bees would increase blasting, but even with an overabundance of bees, relatively high rates of blasting would still occur. In this view, honey bees can minimize the number of blasts by providing the pollination necessary to produce the maximum number of fruits that the plant can sustain, but blasting is rarely reduced to much below 50% in New Jersey where their study was done[17]. This work also demonstrated pretty conclusively, up to a point, that cranberry production per acre was directly related to the number of uprights. This relationship, however, can't extend to an infinite number of uprights. Whereas Marucci and Filmer's[20] data ends at about 200 uprights/ft^2, the data of Roberts and Struckmeyer[22] extends to over 500 uprights/ft^2 and in their study the production dropped off fairly precipitously at about 250-260 uprights/ft^2.

Pollination recommendations

Honey bee recommendations

In his review of the pollination recommendations given for cranberry, McGregor[21] stated, "The pollination recommendations for cranberries lean consistently toward the use of more colonies of honey bees per acre". Perhaps this is partly because of the deterioration of native pollinator populations over time. He provides the data found in Table 2. Scott-Dupree (1995) recommended 1 colony per acre for Canadian cranberry producers[23]. Delaplane and Mayer[4] (2000), after reviewing the literature, state that the average literature recommendation rate is 3 colonies/acre.

Recommendations for Other pollinators

Hutson[14] recommended 448 bumble bees per acre. This was

1 **For those interested in the demise of native pollinators, this paper provides an extensive list of references that deal with the topic.**

2 **In the literature, cranberry doesn't always seem to be considered a marginal pollen producer, examples references [3 & 18]. In reference [18] for example, the author claims that the bee is "showered" with pollen while in reference [3] the amount of pollen is claimed to be in "generous quantity". Perhaps the unstated phrase "relative to nectar production" is meant to be understood.**

3 **When the entire open pollinated area was harvested it produced 90 barrels per acre (1 barrel=100lbs).**

4 **This technique is the major alternative tool to using the "caged plants with and without bees" technique to study the effect of honey bees on pollination.**

Table 2. Number of colonies of honey bees recommended over time for cranberry pollination (Adapted from McGregor[21].

Year	Recommendation
1940	1 colony/5 acres
1946	1 colony/2 acres if weather conditions favorable, if weather conditions are poor, 5-10 colonies per acre might be needed
1958	1 colony/acre
1959	1 colony/2-3 acres
1976	Currently one strong colony per acre is generally used.

* Currently indicates the time of the publication (1976).

based on the fact that there were that many bumblebees in a cranberry bog that was relatively devoid of other insects, but set a good commercial crop.

Cane et al.[21] estimated the number of leaf-cutting bees (*Megachile addenda*) needed to produce a commercial crop of cranberries by two methods: (1) by counting the number of pollen grains removed per flower and comparing that figure to the number of pollen grains in completed nest cells[5] to estimate the number of flowers visited and (2) by using the floral visitation rate, foraging trip duration and the number of trips needed to complete a nest cell. The two estimates of the number of flowers visited per nest cell were exceptionally close (1076 and 1207, respectively). In good foraging weather they estimated that 451 nesting *M. addenda* females per acre would be sufficient to provide a commercial harvest. The authors point out, however, that they encountered high rates of nest parasitism from the cleptoparasite[6], *Coelioxys immaculata*, also in the same family (Megachilidae) as its host, *M. addenda*. This parasitic species would have to be controlled if *M. addenda* were to be relied upon for pollination.

Delaplane and Mayer[4] point out that given the potential of bumble bees for pollination, it would seem advantageous for cranberry growers to manage the area around their cranberry bogs to encourage higher populations of these organisms. They point out that conceivably this could be done by (1) leaving the land around the bogs undisturbed to encourage nesting sites; (2) providing artificial nest boxes along the edges of the bog; (3) culturing supplemental bee pasturage in the areas around the cranberry bogs to promote colony health after the cranberry flowering season. In general, however, such bumble bee conservation measures in cranberry have apparently not been measurably successful.

[5] ***Megachile addenda*** **build leaf-lined cells in the soil, which they provision with sufficient pollen for the larvae that will develop within the cell. The cell is sealed after it is adequately provisioned and the eggs are laid.**

[6] **Cleptoparasite: a parasite that feeds upon (essentially steals) the food stored for the use of the host species.**

Potential for developing a cranberry honey bee.

Shimanuki et al.[25] noticed one of the hives used in their pollination timing study described above consistently produced significantly more cranberry pollen than the other hives (see table 3). Apparently, queen selections from this hive were made that produced colonies that were better than average cranberry pollen collectors, but they were so vicious that they were destroyed[28]. This finding does, however, suggest that it would be possible to breed bees better adapted to cranberry pollination.

Potentials for cross pollination

Marucci and Filmer [19] reported that it had been observed that sometimes cranberry bogs with mixed varieties had greater cranberry productions than nearby bogs with only one variety. These greater productions were sometimes as much as five times the state average. An experiment was set up where mixed varieties were caged with bees in such a way that the bees could work both inside and outside the cages. This caging arrangement was intended to supply approximately equal bee populations inside and outside the cages. There were also two bogs sampled that contained intermingled plants of different varieties that were also sampled. The results were promising, but Free[12] points out that it is not clear that these outcomes did not result from larger bee populations in the areas with mixed varieties than in the areas with a single variety, and that more research should be done.

Colony deterioration in cranberry bogs

Marucci[17] reported that there is an unusually high incidence of European foulbrood, as well as both morale and colony size deterioration, when honey bees are set out in New Jersey cranberry areas. Interestingly, because cranberry and blueberry belong to the same plant family (Ericaceae), a similar situation seems to occur in Michigan when bees are used for blueberry pollination[30]. Perhaps this is because the environments are to some extent similar (low lying areas, with acidic, high organic soils).

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Table 3. Pollen collection from hives placed one week before peak bloom versus at peak bloom[25]

	Most productive cranberry pollen collecting hive	Remaining 5 hives from both placement groups	Remaining 2 hives from early placement group
Total pollen collected (grams)	58.66	135	59.72
Total Cranberry pollen collected (grams)	58.27	45.39	29.62
Percent cranberry pollen collected (%)	99.3	33.6	49.6

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