150 YEARS AND STILL GOING

ROOT PUBLICATIONS

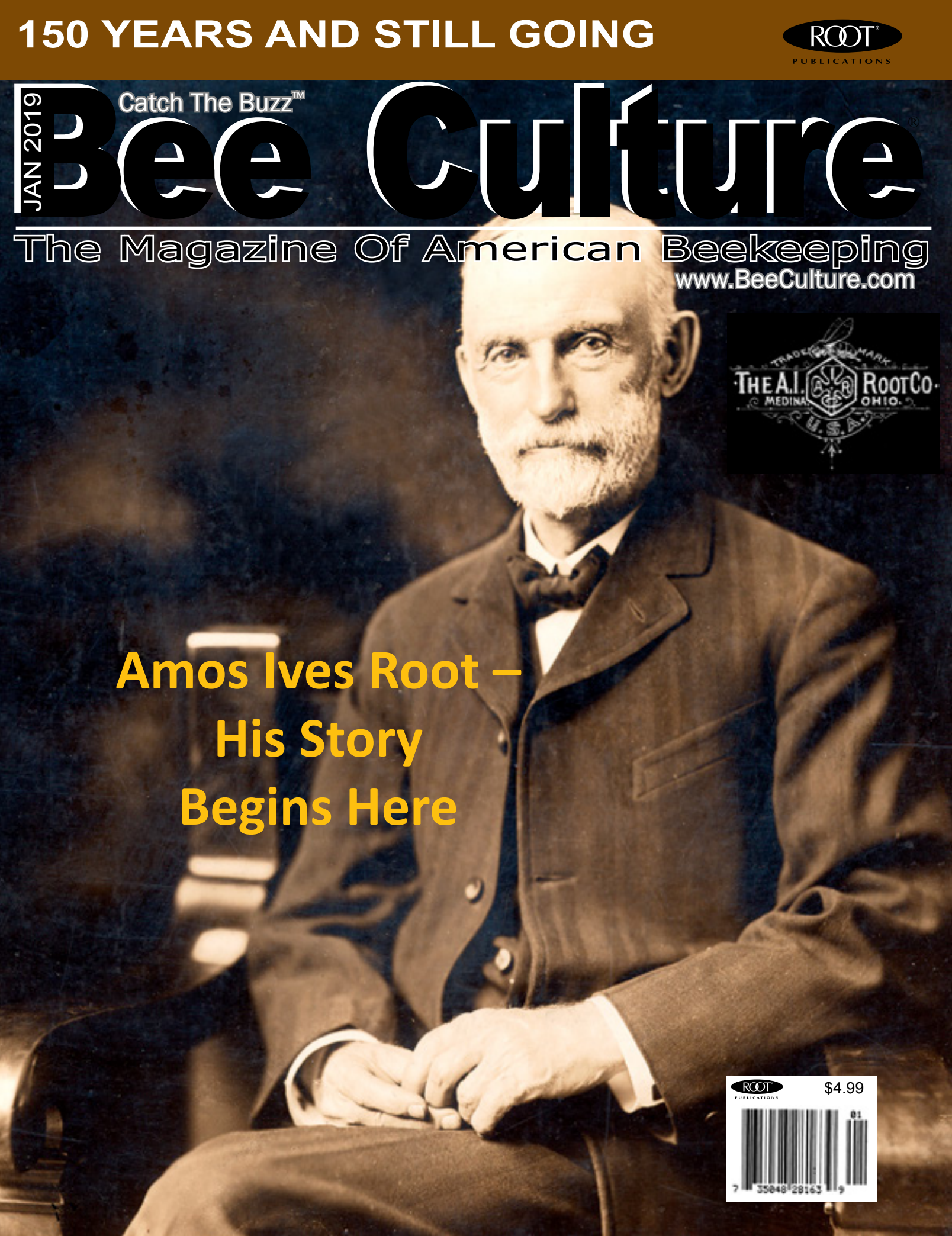
JAN 2019

Catch The Buzz™

Bee Culture®

The Magazine Of American Beekeeping

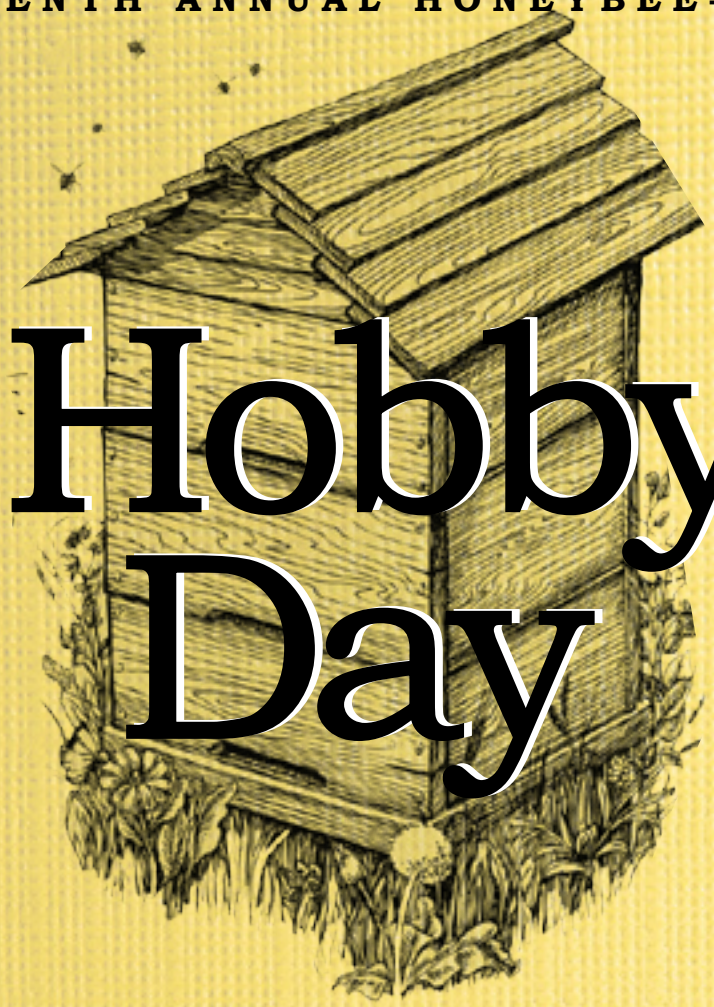
www.BeeCulture.com



Amos Ives Root – His Story Begins Here

ROOT PUBLICATIONS $4.99

ELEVENTH ANNUAL HONEYBEE-FEST



Hobby Day

PRE-ORDER
PACKAGE
BEES
$150

FOR PICK UP AT HOBBY DAY ONLY
LIMITED QUANTITIES AVAILABLE

SATURDAY, APRIL 6TH
OLIVAREZ RANCH
ROAD 20, ORLAND CALIFORNIA
ADULTS $5
KIDS UNDER 11 FREE

9:00AM—3:00PM
RAIN OR SHINE
EARLY BEE BREAKFAST
HOMETOWN MUSIC
& FOOD TRUCKS

LIVE BEEKEEPING DEMONSTRATIONS • MEAD MAKING
COOKING DEMONSTRATIONS • LOCAL CRAFT & VENDOR BOOTHS
LOCAL HONEY • KIDS "BUSY BEE" ACTIVITIES • HONEY TASTING • GUEST SPEAKERS

CALIFORNIA
MONTANA
HAWAII

OHB
NEXT GENERATION BEEKEEPING

CALIFORNIA
530. 865. 0298
6398 COUNTY ROAD 20
ORLAND, CA

VISIT OHBEES.COM FOR TICKETS & DETAILS
*PROCEEDS BENEFIT LOCAL ORGANIZATIONS: LAWS AND PAWS AND ORLAND TOWN AND COUNTRY HUMANE SOCIETY

CAN'T ATTEND HOBBY DAY? ORDER BEE PACKAGES WITH YOUR LOCAL DISTRIBUTOR!

WISCONSIN
Dadant & Sons
Brian Lox
blox@dadant.com
(920) 261-5363
W2763 East Gate Dr.
Watertown, WI 53094

MINNESOTA
Nature's Nectar
Jim Kloek
(651) 439-8793
11108 Manning Trail N.
Stillwater, MN 55082

OHIO
Queen Right Colonies
Denzil & Sheila St. Clair
(440) 647-2602
43655 State Route 162
Spencer, OH 44275
www.queenrightcolonies.com

MICHIGAN
A.W.S. Bees
David Anthony
(810) 621-4371
Leo Stevens
(810) 639-3640
1268 Nichols Rd.
Swartz Creek, MI 48473

Dadant & Sons
Chris Barnes
(877) 932-3268
1009 Industrial Avenue
Albion, MI 49224

UTAH
Knight Family Honey
Lee & April Knight
(801) 706-0984
lee@knightfamilyhoney.com
1761 South 970 West
Lehi, UT 84043
www.knightfamilyhoney.com

PENNSYLVANIA
Mann Lake Ltd.
(877) 829-4077
458 Stewart Road
Wilkes-Barre, PA 18706

WASHINGTON
BEEMANIACS
7619 W Woolard Rd
Deer Park, WA 99006
livebees@beemaniacs.com
www.beemaniacs.com

We write over 88% of the Beekeepers in the program Nationwide.

BEEKEEPING INSURANCE SERVICES

APICULTURE INSURANCE PROGRAM

A Specialized Program for Beekeepers

Available Nationwide

Offering All Forms of Insurance Including:

- ✳ USDA Apiculture
- ✳ Property
- ✳ General Liability
- ✳ Automobile
- ✳ Life Insurance
- ✳ Home & Farm Insurance

We are Proud Members & Sponsors of:

- ✳ American Beekeeping Federation
- ✳ American Honey Producers Association
- ✳ California State Beekeepers Association
- ✳ Florida State Beekeepers Association
- ✳ Minnesota Honey Producers Association
- ✳ Montana State Beekeepers Association
- ✳ North Dakota Beekeepers Association
- ✳ Texas Beekeepers Association

Kevin Rader: Buzzus@beekeepingins.com

www.beekeepingins.com

888-537-7088

Bees Love

Global Patties

You will too

Keep your hives strong and healthy with less effort and low cost
Reduce winter loss and see faster spring build-up
Help your bees thrive despite drought and stress from mites and disease

Two North American Factory Locations

Plus depots across the U.S. and Canada to Serve You Best

BAY 2 - 8 East Lake Way NE, Airdrie Alberta T4A 2J3
Phone: 1-403-948-6084 - Fax: 1-403-948-6901

150 Parkmont West, Butte Montana 59701
Ph: 1-406-494-4488 - Fax: 1-406-494-3511

Call Us Toll Free in North America at 1-866-948-6084

We make protein and pollen patties to your specifications
using only fresh, high quality, proven ingredients. Satisfaction guaranteed.

Be sure to visit our website

www.globalpatties.com

For our locations, news, ideas, specials, and much more...

Your bees will thank you

A&O FORKLIFT

WWW.HUMMERBEE.COM

THE CLASSIC HUMMERBEE IS BACK!

TUNED HYDRAULICS, A BRAND NEW TRANSFER CASE DESIGN, AND IMPROVED ARTICULATION JOINT MAKE THIS HUMMERBEE EVEN BETTER. ORDER NOW FOR QUICK DELIVERY!

Engine - Kubota Diesel!

Hydraulics - 2 speed!

Drive - 4X4!

Lift - 2,000 lbs!

CALL US TODAY!

800-943-8677

Hummerbee®

Rough Terrain Forklifts

Frames - Plastic

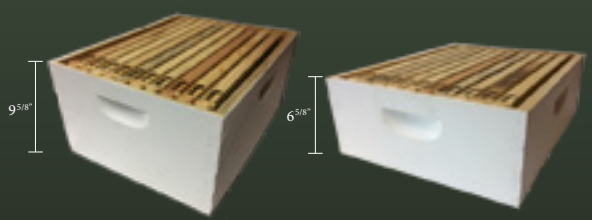
- Super Strong and Durable
- Safe - FDA food grade plastic
- Easy to use - No Assembly Required

Frames - Wood

- Stronger than Industry Standard
- New 1/2" thick end bars - 3/4" top bars
- Assembled, Glued, and Stapled

Snap-in Foundations

- Impervious to wax moths, rodents, and hive beetles
- Preferred by Professional Beekeepers
- Precision molded, perfect cells
- Easy to use - Snaps into wood frames



Commercial Grade Boxes

- Honey Supers & Hive Bodies
- Added Strength 1 – 5/8" Top Joint
- Pacific Northwest Ponderosa Pine
- Assembled, Primed, & Painted

Pierco®

Genuine Beekeeping Equipment

EST. 1977

Buy Pierco - Buy Quality

Factory Direct Store

New Lower Prices - Buy Now and Save!

FREE SHIPPING * See website for details

Check us out at: www.Pierco.com

FOR ALL YOUR BEEKEEPING NEEDS

HOBBYISTS / SIDELINERS / COMMERCIAL BEEKEEPERS

We Offer DOUBLE & TRIPLE WAX

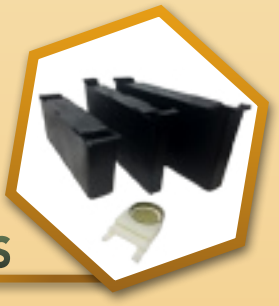
SUPERDFM

PROTEIN SUPPLEMENTS

BEEKEEPING KITS

EXTRACTING & BOTTLING

PROTECTIVE WEAR



FEEDERS

Call or Visit us at:

Factory/Store Address: 680 Main St. | Riverside, CA | 92501

Get Connected | (909) 575-2013 Made in the USA

Bee Culture

January Features . . .


Page 28


Page 44


Page 51


Page 90

800.289.7668
Executive Publisher – John Root
Associate Publisher, Senior Editor – Kim Flottum, Kim@BeeCulture.com, Ext. 3214
Assistant Editor, Design – Kathy Summers, Kathy@BeeCulture.com, Ext. 3215
Social Media, Event Specialist & Subscription Coordinator – Amanda DeSimone, Amanda@BeeCulture.com, Ext. 3255
Advertising – Jean Newcombe, JNewcombe@BeeCulture.com, Ext. 3216
Publications Assistant – Kelsey Kelly, KKelly@rootcandles.com, Ext. 3220

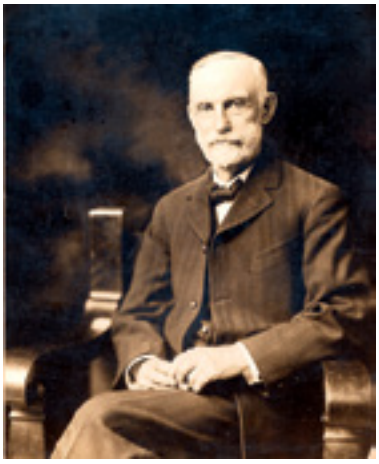
Contributors
Clarence Collison • James E. Tew • Ann Harman • Kim Lehman • Phil Craft
Connie Krochmal • Jessica Louque • Toni Burnham • Ross Conrad • Jennifer Berry • Ed Colby

POSTMASTER: Send address changes to
BEE CULTURE, The A.I. Root Co., 623 W. Liberty St., Medina, OH 44256

Subscription Information
U.S., one year, $25; two years, $48. Newsstand price: $4.99. All other countries, (U.S. Currency only), $20.00 per year additional for postage. Digital Edition $15. Send remittance by money order, bank draft, express money order, or check or credit card. Bee Culture (ISSN 1071-3190), January 2019, Volume 147, Issue 1, is published monthly by The A.I. Root Co., 623 W. Liberty Street, Medina, OH 44256. Periodicals Postage Paid at Medina, OH and additional mailing offices.

Subscriptions, Book Orders – 800.289.7668, Ext. 3220 • www.BeeCulture.com • subscriptions@BeeCulture.com

Advertising – 800.289.7668, Ext. 3216; JNewcombe@BeeCulture.com


A.I. Root

Organic

VARROA CONTROL

Mite Away® Quick Strips

FORMICPRO

FOR TREATMENT OF VARROOSIS
CAUSED BY VARROA DESTRUCTOR IN HONEY BEES (APIS MELLIFERA)

NOD
NATURES OWN DESIGN
— APIARY PRODUCTS —

NOD APIARY PRODUCTS LTD.

Bee Cozy

WINTER HIVE WRAPS

Healthy Bees. Healthy Planet.

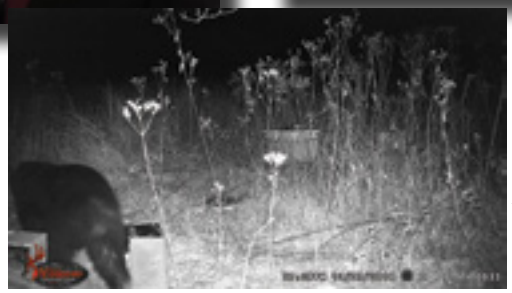
Available through your beekeeping supply company!

866-483-2929 | 613-398-8422 | www.nodglobal.com | info@nodglobal.com

Bee Culture's Best . . .

Page 71

Page 67



Page 83

In Every Month –

TODAY'S POP QUIZ!!!

Are you a Beekeeping Retailer?

Are you losing sales to Amazon?

Is your current supplier competing with you for sales?

Do you speak directly to an "Order Taker"?

If you answered YES, here's your solution!

SOUTHEAST BEE SUPPLY

Best wholesale prices around!

No internet Sales!

We will not compete with YOU at trade shows!

Get one-on-one service.

As a registered dealer you will have our personal cell #'s.

Call at your convenience (truth in advertising - if you call us at 3am, we will call you back...later).

The best deals in hardware and protective clothing!

johnsullivan@triad.rr.com

Walnut Cove, NC

Cholesterol In Pollen

My mentor is telling me about the importance of plant cholesterol in pollen. I know of its significance in the health and longevity of a honey bee's life (especially for Winter bees!), but it also may be the key ingredient for effective metabolizing of pollen or pollen substitute. From what I understand Borage is one of the cholesterol rich plants you can add to the list?

David Hanigan
Yacolt, WA

Tallow Not Tolerated

The article about invasive species brings up an issue that I came across dealing with the Chinese tallow tree. Irradication efforts are under way to rid this invasive tree from the landscape in the southeast. Many beekeepers in this region rely on this species for honey and pollen in May to June. But I have noticed every spring and fall when the seeds are on the tree that many species of birds, many which are migrating, are using the tree for food. I personally feel there are more positive characteristics with this tree than problems. I understand the need to maintain native species and fully support that effort but it needs to be re-evaluated in this case and limited to sensitive areas.

Tom Sipprell
Orlando, FL

Happy Another New Year

I so enjoy *Bee Culture* Magazine. Thanks for being a part of the cog that all spokes may connect.

New Year Advice:

- Listen to Beekeepers' rants, advice and stories. At least they admit it's their opinion.
- Offer your own accounts to Fledgling Beekeepers. They're hanging with you because they have an interest.
- Share what Honey you can afford. Smaller jars will reach twice the people than one larger jar. They'll come back if they're going to, regardless.
- Keep your Beeyard appealing, well groomed and manicured before guests come. It's important to present well to preserve Our Way.
- Support local range fed Egg Producers. They talk to a lot of people. They enjoy it, as they ain't making money at it.
- Role model good health. Fitness, Conversation and Hosting is contagious.
- Eat locally grown or natural. Talk about it. People want to do the same but don't initially understand how to pursue.
- Exercise and be friendly. It's good for you.

I appreciate Our Beekeeping Community.

Brent Nichols
Coastal, GA

Beehive Awning Correction

Thank you so much for including the Beehive Awning to your December issue New Products.

I did make one (senior moment) mistake in my communications.

Our office number is 203.637.4903.

I will also *include* shipping in the wholesale multiple order of 25 units.

Any retail units will not include shipping.

Joel Dawson
Old Greenwich, CT

BC Becoming Political!

In October 2018 issue of *Bee Culture*, we have "An Editorial – The Peoples Department".

There are two parts of it: The article by agriculture writer Alan Guebert and the Editors Comment written by Kim Flottum.

Alan Guebert has written about what is happening in Department of Agriculture, specifically regarding the relocation of the Departments of Economics Research Service (ERS) and the National Institute of Food and Agriculture (NIFA). The relocation sites have not yet been determined. Alan Guebert interprets this decision as harming agriculture.

Kim Flottum goes even further and misinterprets facts and shows irresponsible bias stating the Department of Agricultures has

Bee Culture
623 West Liberty St.
Medina, OH 44256
mailbox@beeculture.com

the goal of squashing the ERS. This is a despicable attempt to illicit sympathy from readers. Kim writes how important the ERS is to the beekeeping industry, which is true, but the location of the ERS in Washington DC is irrelevant to its functionality. Technology has proven the ability for work to be done outside of the high costs of the metropolitan regions. He also laments about poor "civilian employees denied a pay raise this year," perhaps this is further proof they should relocate out of expensive Washington, DC. I am not afforded a pay raise yearly myself, in fact I am lucky to have a raise once every three to five years. Being fiscally responsible by relocating a business that can perform in almost any physical location should not be misconstrued as some political agenda or an attack for honest reporting. All businesses should be scrutinized regarding expenses. I see the relocation as another step to fight the bureaucratic swamp in Washington, DC. They are so arrogant that they cannot stand being treated the same as regular Americans are everyday in business.

The ERS and NIFA are NOT being squashed – they are merely being relocated. If they are relocated to Columbus, Ohio or Indianapolis they will be serving us just as well as they have from Washington, DC only with less overhead. So the main issue is relocation of established bureaucrats from Washington, DC. They should understand that they are not different that other Americans.

Most, highly qualified and educated Americans are relocating a few times in their careers. For example, in last 30 years, I have moved four times for my career. My Institution (hospital) was rearranged a few years ago and most directors and managers were relocated or found another job and nobody was crying or writing how this was President Obama's fault or his agenda in creating Obamacare. The constant reach to connect business decisions with the Trump administration as some ulterior motive beyond fiscal responsibility is a weak reach and lazy journalism. It is the same cry the media echoes in lazy reporting demonstrating a consistent slant to undermine accountability for costs. It attempts to manipulate readers opinions rather than stating the facts objectively for the reader to make an informed decision.

Kim Flottum attempts to make us lament for the poor "civilian employees denied a pay raise" for one year. What about the innumerous Americans that have not have raises in multiple years. This is not an insult to civilian employees, this is the same reality normal Americans face everyday.

In past 10 years, corporate America has cut pay raises or at least minimized them. (I got 2% twice during this period of time.) This has been occurring well before the Trump administration was in office. Government employees have been the only Americans getting pay raises almost every year.

In conclusion – The ERS is not being squashed but relocated. The main issue is that Washington, DC bureaucrats should be held to the same standard of fiscal responsibility all Americans are held to. When they are treated as normal Americans they whine and complain and hate it!

Trump is keeping his promise!

Jacek Wierzbicki
Troy, MI

Bees For Development

Bees for Development North America is now established as 501©(3) non-profit corporation. We would love to begin gaining North American recognition as 'the beekeepers' charity.'
Please visit **https://beesfordevelopmentnorthamerica.org/** for more information.

Nicola Bradbear

Propolis Tincture

Great article but . . .
I just want to point out an inaccuracy or two, as a chemist I just could not help it :)

"Propolis Tincture – Mix two parts propolis by weight to nine parts of clear grain alcohol, by weight (we use 75 proof or higher vodka, or Everclear) (Do not use ethanol alcohol – it is poisonous!)."

The two issues: 1) you probably wanted to write 75% alcohol (that is 150 proof) . . . 75 proof means 37.5% alcohol – such as regular vodka . . . if you use that you are greatly wasting the propolis as the higher proof dissolves more. Typically I see folks using Everclear or such which is 90-95% alcohol (180-190 proof).

2) "Do not use ethanol - it is poisonous" . . . Ethanol or Ethyl alcohol or C2H6O = the exact same thing -just chemist lingo – it is a typical drinking alcohol such as Absolut vodka – certainly overdose aka getting drunk and going way beyond may result in death but . . . that does not happen very often – otherwise bars would not be very profitable. I'm pretty sure you wanted to say "Do not use METHANOL" as methanol, CH4O, is poisonous. Methanol typically gets added to ethanol you can buy at hardware stores . . . that mixture is called . . . DENATURATED ALCOHOL and is poisonous however, as I said before, ethanol alone is not. **http://www.differencebetween.net/science/difference-between-ethanol-and-methanol/**

Jan Svagrovsky

Propolis Project

Collaborative research efforts between members of the 88th Civil Engineer Group Natural Resources Program, the Propolis project and researchers at Penn State, Purdue and Central State universities have yielded promising results in the production of honey bees that are naturally able to defend themselves from harmful *Varroa* mites.

Honey bees are one variety of insects known as pollinators and are critical to the pollination process of a third of the food people consume, such as fruits and vegetables, said Dwight Wells, a beekeeper with the Propolis project.

According to the project's website, its mission is to combat the recent decline of pollinators in theMidwest and restore healthier honey bee populations in Ohio.

"In recent years, honey bees have shown an accelerated rate of decline, due to a number of factors, including increased susceptibility to diseases and pests, such as the *Varroa* mite, a lack of proper forage, pesticide exposure and poor hive management procedures," Wells said.

The Propolis project came into being around 2014 thanks to support from the Levin Family Foundation, which supports agencies in Dayton and surrounding areas that feed, clothe, educate and provide health-related support to people in need. The project started in 2014 to increase pollination at Wright-Patterson Air Force Base on Huffman Prairie, Wells said.

The initial federal government guidance to support habitat restoration projects for pollinators was issued in a June 20, 2014, presidential memorandum, creating a federal strategy to promote the health of honey bees and other pollinators.

Wells, who has also served as president of the West Central Ohio Beekeepers Association since 2010, began his collaboration with Purdue University in 2011 with their honey bee breeding program. At the same time, he started trapping feral – or wild – honey bees in western Ohio, based on his work with both Purdue and Penn State.

Wells and personnel from the base Natural Resources Program also began keeping bees at Wright-Paterson in 2014. Darryn Warner, Natural Resources Program

Manager at the base, has supported the effort from the beginning.

"A lot of people don't realize or think about it, but a beehive that is managed by people is nothing more than like a dairy cattle herd or a feedlot of pigs that have to be managed and cared for. They lose some of their natural behaviors that wild bees still exhibit," Warner said.

"After four years of research, Dwight (Wells) has recently confirmed the honey bees on base, through natural selection, exhibit 'chewing behavior,'" said Danielle Trevino, natural resources specialist. "This behavior, only exhibited in a small percentage of honey bees, protects them from the *Varroa* mite. The mite is perhaps the most serious threat to honey bee colonies worldwide."

Wells has been working with Penn State through U.S. Department of Agriculture Sustainable Agriculture Research and Education, or SARE, grants since 2015, and in 2016 he was conducting tests of honey bee chewing behavior, using a microscope to check for chewing behavior on the mites from feral stock and bees on base and throughout western Ohio when he discovered the bees had started to evolve through natural selection and kill the mites naturally.

"When the mites came into Ohio in 1987 there were no resistant bees in Ohio in the feral stocks. We had around 40,000 feral bees, but, by 1992, all the feral bees were killed by the mites," said Wells.

Commercial beekeepers were using chemicals to kill the mites on their bees, treating their bees up to 10 times a year to kill the mites.

"That is not sustainable," said Wells. "Honey bees are used for pollination. As an example, there are 1.2million acres of almonds grown in California that have to be pollinated by honey bees. Commercial beekeepers take out 2.4 million colonies of bees every year to California to pollinate the almonds from Feb. 15 to March 15. Then they have to get the honey bees out of the orchards because the almond growers spray fungicide on the trees. This is not a sustainable system, and it's starting to fall apart because of the chemical use the bees are getting hit with."

"Killing a bug on bug hasn't been good," Wells said. "This has been going on for 35 years and because mites inbreed and create a new generation every two weeks, they have developed resistance to the chemicals, and we're running out of chemicals. Researchers know we need to have bees that have become a natural enemy of the mites. Mice and mites both reproduce exponentially, but mice have natural enemies – dogs, cats, snakes, mouse traps. Mites, until now have had no natural enemies."

Wells also works with the Heartland Honey Bee Breeders Cooperative at Purdue, helping to share information, techniques and disease-resistant genetics between queen producers in seven states.

"It's a community of land grant universities, people at the base, and others working together. We're finally getting enough people on board to fight this mite," he said.

When the Wright brothers were at Huffman Prairie in 1904-1905, they were learning to be able to control their airplane in flight and teach themselves to become pilots. While they were here, Amos Ives Root, who was an Ohio entrepreneur who developed innovative beekeeping techniques during the late 19th century became the only eyewitness to publish articles about the successful airplane flights made by the Wright brothers here, according to Root's website.

Now, 113 years later, innovation, technology and people with a desire to save pollinators have come together again at the birthplace of powered flight to help honey bees fly, fight and win against a foe with no natural enemies.

Reprinted from the Skywriter
Wright Living Newsletter

Congrats to Dr. Bryant

The University System Board of Regents have designated 15 faculty members and seven agency service, extension or research professionals within the A&M System as Regents Professors and Regents Fellows for 2017-2018.

"These outstanding individuals are doing incredible work on behalf of the A&M System and the

entire state of Texas," said A&M System Chancellor John Sharp. "They exemplify the values and commitment to excellence that defines the A&M System and I am grateful for their dedication."

The Board established the Regents Professor Awards program in 1996 and the Regents Fellow Service Awards program in 1998 to recognize employees who have made exemplary contributions to their university or agency and to the people of Texas.

This year's recipients of the Regents Professor Award are: Dr. Lal K. Almas, West Texas A&M University; **Dr. Vaughn M. Bryant, Texas A&M University**; Dr. Lisa Campbell, Texas A&M University; Dr. Gerard L. Coté, Texas A&M University, Texas A&M Engineering Experiment Station; Dr. Jian Q. Feng, Texas A&M Health Science Center; Dr. Amir M.H. Ibrahim, Texas A&M University, Texas A&M AgriLife; Dr. Syed Hussain A. Jafri, Tarleton State University; Dr. Nereu F. Kock, Texas A&M International University; Dr. Akhtar H. Lodgher, Texas A&M University-San Antonio; Dr. Thomas J. McDonald, Texas A&M Health Science Center; Dr. Lijun Qian, Prairie View A&M University; Dr. Antonietta Quigg, Texas A&M University at Galveston; Dr. Robert L. Smith, Texas A&M University-Corpus Christi; Dr. Sang C. Suh, Texas A&M University-Commerce; and Dr. Randall H. Williams, Texas A&M University-Kingsville.

Recipients of the Regents Fellow Service Award are: Dr. Marvin L. Adams, Texas A&M Engineering Experiment Station; Dr. David R. Ellis, Texas A&M Transportation Institute; Dr. Don L. Renchie, Texas A&M AgriLife Extension Service; Mr. James B. Rooni, Texas A&M Forest Service; Mr. Edward Schneider, Texas A&M AgriLife Extension Service; Ms. Rebecca L. Tate, Texas A&M Engineering Extension Service; and Dr. Qingwu Xue, Texas A&M AgriLife Research.

The selection process for the awards begins with a call for nominations from the chancellor. Final nominations are put forth to the chief executive officer of each respective entity. They are then subject to a System-level review consisting of academic vice chancellors and past recipients of the awards. Finally, nominations are forwarded to the chancellor and the board for final approval.

Vaughn Bryant

Dr. Vaughn Bryant is a frequent contributor to our magazine on techniques to identify honey using pollen, and has a chapter on pollen ID and honey in our upcoming ABC & XYZ Of Bee Culture Encyclopedia. His work at the University certainly contributed to this award, but so too has his work in criminal forensics, honey identification for private and commercial producers, and working with honey packers and dealers on honey imports. Congratulations Dr. Bryant on this very special recognition. It is well deserved.

To date, 239 A&M system faculty members have been recognized with the Regents Professor Award and 142 agency professionals have received the Regents Fellow Service Award.

Happy Birthday Charles

When **Fortnum & Mason** commissioned a birthday present for the **Prince of Wales**, its choice couldn't have been more appropriate: three exquisitely handcrafted beehives, a reference not only to the Prince's concern for the plight of bees, but also to the hives on the roof of the Fortnums building, from which it produces its Piccadilly London Honey.

The Prince suggested a designer for the project: Anthony Paine, an architect known for blending classical references with contemporary buildings, whom he met several years ago and who has since worked on designs for the Prince in Cornwall and at Poundbury.

New For The Beekeeper –

Honey Bee Hobbyist, The Care and Keeping Of Bees. 2nd Edition. Dr. Norm Gary. Published by CompanionHouse Books. ISBN 978-1620083154. 224 pages. Color. Soft cover. $19.98.

Coincidences in life are always interesting, and sometimes they can be really interesting. Unless you've been living under a hive stand for the last month or so, you've heard about the passing of Stan Lee, the guy who made all kinds of movies, and TV shows, about scary things and super people – Spider Man, The Avengers, Ant Man and lots more, and his TV show, Super Humans.

The TV show, which was on for four seasons, had people who got bit by snakes, swam underwater for way too long, took sledgehammer blows to the head, and could summon and be covered by – Bees. And Dr. Norm Gary was the bee guy, and, he told me, it was going to be the last time he was going to do a wholebody bee beard, and I should come out to the Bee Lab in Davis and watch. So I did.

The first day, he did the wholebody beard, covered head to almost foot for the camera. But something interesting happened the second day. The producer wanted a real close-up of a bee stinging somebody, with the venom sac pulsating and all the horror and pain that goes with it. Norm got a bee and laid his finger down on top of a hive with the camera about an inch away and held the bee with a tweezers so she would sting him. She did, and Norm's finger swelled up like you wouldn't believe. Really.

So, he needed a volunteer to be in his place. There were about 12 or 15 of us watching, all beekeepers, and when he looked up, everybody but me took a step back – and I was the volunteer.

So my finger and a stinging bee got to be on Stan Lee's TV Show, Super Humans. He got it about right.

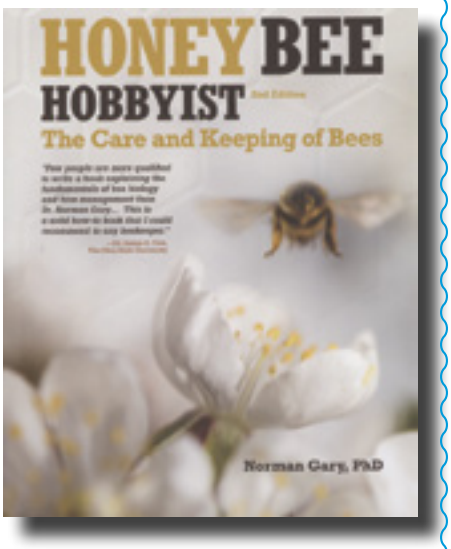
And last month as I was remembering Stan Lee and his cameo appearances in his movies, and interviews over the years, I was recalling that day in Davis, when in the mail comes Norm's new book, the second edition. Like I said, interesting coincidences . . .

If you have a copy of his first edition you have a feel for photos and chapters, but this edition has a few extras, and some fun chapters. The basics are the basics, and over 50 years of keeping bees taught Norm the basics, including fundamental biology, colony management, honey and hive products. But, Entertaining with bees is something you don't often see, and should. Indoor and outdoor observation hives, and how to do a bee beard are examples of subjects most, probably no beginner's beekeeping book is going to have.

A good glossary and resources list round out the book, and all in all, a book every beginner should be aware of.

And Norm, thanks for my two minutes of fame, and pain.

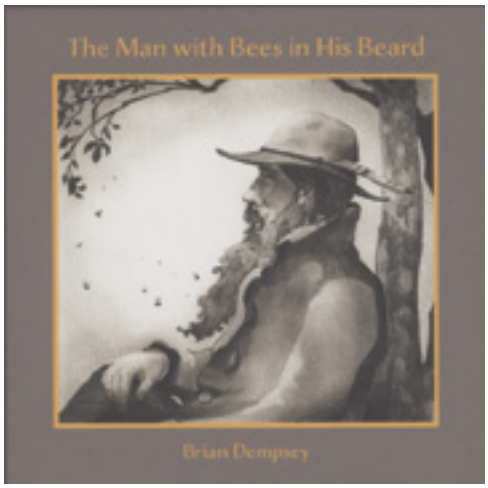
Kim Flottum



Plants Honey Bees Use in the Ohio and Tennessee Valleys, by Shannon Trimboli. Published by Solidago Press. ISBN 978-0-9996321-0-9. 6" x 9", 301 pages, color throughout

This is the first book to focus on the plants used by honey bees in the states containing the Ohio and Tennessee Valleys (AL, GA, IL, IN, KY, MS, NC, OH, PA, TN, VA, WV). This book was written as a guide for anyone who is interested in honey bees. Written by a beekeeper and wildlife biologist, *Plants Honey Bees Use in the Ohio and Tennessee Valleys* contains full color pictures and descriptions of over 175 plants, one plant per page with a photo, organized by when they bloom. Also included are chapters about honey bees and their plight, honey bee foraging behavior, factors that influence nectar and pollen production throughout a plant's range, and planting for honey bees. Whether you are a beekeeper who wants to know what flowers your bees are visiting, or a homeowner who wants to know what you can plant for honey bees, this book is for you. But all things considered, the numerous maps that show everything written about and the appendices are what make this book. Plants grouped by family, by common name and then scientific name, Ecoregions for each of the states listed, and a list of invasive species and noxious weeds by state, plus an excellent list of references and web sites round out this very useful resource.

This book actually came out several months ago, and in a very unusual twist of fate, we were mailed, and we actually misplaced two review copies. I finally purchased one on Amazon so I could share this with you, and I still can't find the lost copies. But, it was worth the replacement price. And if you live east of the Mississippi river, you need this book. – *Kim Flottum*



The Man with Bees in is Beard, by Brian Dempsey. Published by Chatwin Books. ISBN 978-1-63398-058-7. Available from the publisher or Baker and Taylor. 32 pages, for children 4 – 8. Drawings in black and white. 8.5" x 9". $19.95.

The author is a parent, an artist and a poet. All of these are evident in this wonderfully peaceful child's book written to read together, and explored together. The dreamy drawings invite comment and wonder, and adults and children will enjoy the story.

A sample: The man with bees in his beard did not wish for a large house or the weight of money in his pocket or even the company of others. No one knows how the bees got there just that they never stung. He was their home.

What a vision! And what a perfect bedtime story. A dream of soft wind and the hum of nothing when everything is quiet. – *Kim Flottum*

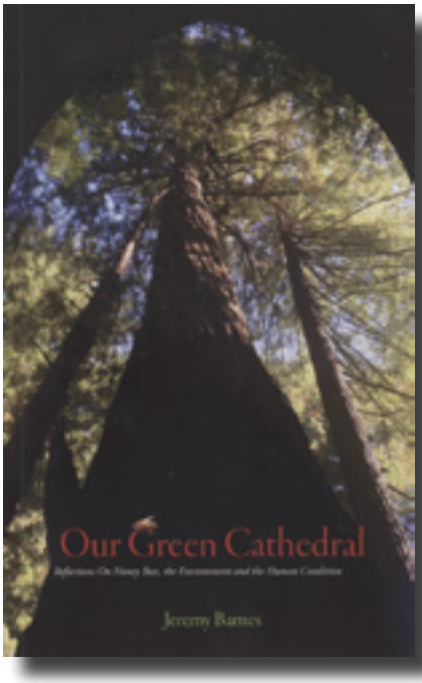
Our Green Cathedral. Reflections On Honey Bees, the Environment and the Human Condition, by Jeremy Barnes. Published in the US. ISBN 978-0-578-40628-2. Available from Ourgreencathedral.com. 11" x 7", 150 pages. Black and white. $19.95 plus US shipping $2.95.

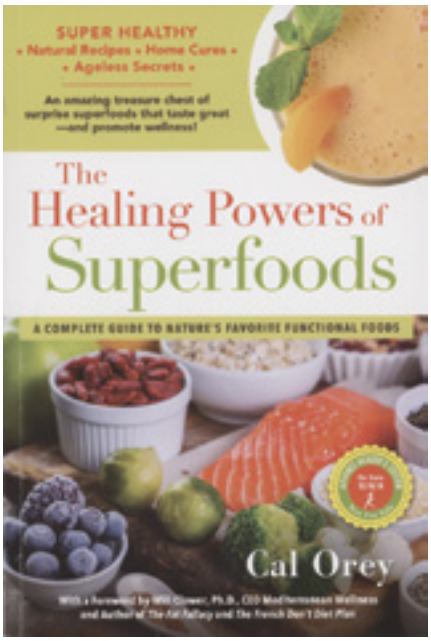
I read a lot of beekeeping association newsletters. Maybe 25 or 30 state and regional associations, and even more locals. Most get a glance, upcoming speakers, events and the like and then on to the next one. Some get more than a glance because of the politics in an area, the basic information on local beekeeping, the size of the group, and sometimes because there's a contributor who makes it worth my while to read this month's contribution. Jeremy's regular stories fit well here. I met him several years ago at a meeting of his group, so had a connection, but didn't realize how long he had been doing this, and of course I missed some over the years. Nor did I have a feel for his background....living in Africa, England, a teacher of history, the value of mentors and his travels from beginner to more experienced.

Then in the mail this book shows up. There's like 95 different stories in it. A collection from the first nine years of his task in the PA Newsletter he writes for. Some are a couple pages long, some much, much shorter, a simple list of beekeeping addiction disorders for instance. But each is a work that stands alone...and each is truly a work of literature art, and each is a story worth telling.

Like, Why I don't have a gps in my car, or, The beekeeper's wife, something about Toxic soup, or bringing together surgery and bees, 1.3 billion pounds of pesticides every year is a story, and, plants make all forms of life possible....the list encompasses over 90 such stories, each a gem, each worth the few minutes it takes to read, some longer, some shorter.

The author has a gift for telling stories. So send me the next newsletter. And meanwhile I'll read again those you've already told before. Thanks. – *Kim Flottum*





The Healing Powers of Super Foods. A Complete Guide to Nature's Favorite Functional Foods. By Cal Orey. Published by Kensington Publishing Corp. ISBN 978-0-8065-3898. 6" x 9", 316 pgs. Soft cover, black and white. $16.95.

Cal Orey has done a bunch of healthy eating, healing power books – using vinegar, olive oil, chocolate (really), coffee and honey. We've looked at the honey book for obvious reasons, and the olive oil book because I really like olive oils. Her latest work sort of takes a look at 20 healthy foods with a boat load or recipes using them in everyday cooking. It's the pairing of two or more of these that make the final outcome a Super Food. The top 20 include apples, berries, crucifers and greens, nuts, poultry, seaweed, grains and a whole lot more. There are some home remedies from these she includes and an excellent reference and resource guide. This isn't the only cookbook and healthy guide you should have, but it's one that should be there. – *Kim Flottum*

More That's New –

Introducing the new Pro Nuc, the first nuc box actually designed with the beekeeper in mind. As the nuc market continues to grow, it was time to come out with a product designed for a quality presentation. Up to now we as bee professionals hand the customer a flimsy cardboard or corrugated plastic box full of bees. Usually with the lid taped shut, sometimes we even put them in a laundry bag to catch escapees, all the while worrying like crazy about them cooking the bees from not enough airflow!

The Pro Nuc is designed to give you a quality box to present to the customer, for the same price range as the folded one. Its a sturdy and robust nuc with all the features to make your life easy, and the customer impressed with your product presentation.

The Pro Nuc itself is a sturdy recyclable plastic tote with a lid that firmly latches and doesn't let bees escape. Drain holes in the bottom let any moisture out, and keep bees in.

The ends of the box have been lowered, no more digging frames out with a have tool, the ends are exposed for easy removal. So much for prying frames araound.

The nuc is designed to keep frames from sliding and banging in transit. Stops on the frame rest and retainers in the lid, keep frames in place, without crushing bees, all while leaving space on either side for those really full nucs we like to provide.

The lid has some great features for you, the pro, and your customer! first off its reversible. Put it on in the vented position and you instantly double the area open for airflow, working just like the eaves in your house and yet bees are still contained! If thats to much turn it around and stop airflow under the lid.

It has two built in feeder details designed to allow hive top feeding, and yet no escaping bees. One is designed for the standard pop bottle top, the other is set for the 1 gallon feeder cans commonly used.

Raised details on the top provide a secure location when stacking them up

The Pro Nuc has two sliding doors designed to keep rain out when up, and let air flow but not bees when down. and are designed to provide bee tight shipping without cutting off airflow.

The Pro Nuc is designed to nest and stack for shipping, allowing for reduced shipping cost to you.

You spent your time building great bees for your customers, be sure to present them in the best possible package!

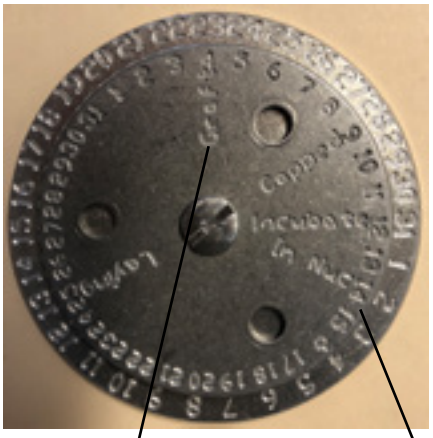
Dadant and Blue Sky are currently on board as dealers. Check the website for more information, **www.bee-pros.com**.

DC's Gadgets – dcgadgets.blogspot.com.

Frame Fingers – They are pocket sized frame holders, designed to hold a single frame on a standard sized hive body. $10 plus $3.95 postage.

Queen Breeding Calendar Disk – The inner wheel refers to when the egg we want to graft was laid. (Trying to differentiate between egg and larvae age just gets confusing.) Grafts are taken on day four. Simply line up the word Graft on the inner wheel witht he current date on the outer wheel. In the example we're grafting on the 23rd. So we can either cage the cells or move to an incubator on the 31st and put in nuc's on the 2nd. Now if this were a monthw tih only 30 days, simply advance one day after grafting. We still graft on the 23rd but incubate on the 1st and in place nuc's on the 3rd. Look for a laying queen around day 25 but there are still variables involved in that part. $15 plus $3.95.

To purchase and for more information **https://dcsgadgets.blogspot.com/p/beekeeping-gadgets.html**



The Thriving Hive

Hobby beekeepers' are looking for a simple system that they can easily manage, and keeps their bees alive. When you look at nature, bees live in a hollowed out tree with thick walls, rotted wood on the bottom, and a whole tree on top. The leaves of the tree shade the tree in the hot days of Summer, but Fall off so the Winter sun can warm the tree, creating a thermal mass.

When you look at the traditional bee boxes are comprised of ¾" boards – even on the lid – you quickly realize that traditional beekeeping is far from intuitive, and nothing at all how the bees would live naturally.

The Thriving Hive was designed to combine the best parts of nature, with the easy parts of beekeeping. The box is large enough to hold 50 deep Langstroth frames, but at the same time easy to manage internal size, for colonies that might only need six frames. Instead of tearing apart layer after layer of boxes and comb to do inspections, the Thriving Hive you simply open the lid; in fact, most inspections take less than three minutes!

The box was designed to face south, and the lid extends out just enough to keep the front of the box in shade in the Summer, but when the sun is low in the sky in Winter can warm the front of the box – using nature to your advantage. The walls of the box are insulated, as is the roof – which has an R value of 20 – so you don't have to worry about respiration ever freezing on the lid and raining on the bees when the sun comes out.

The floor of the box is also insulated, but with a layer of peat moss, to simulate a hollow tree by allowing for the microclimate that is in a wild hive to develop, but also it helps with absorbing moisture. Because of the way the box is designed, bees use less energy over Winter, and as a result need less honey to keep the box warm. The Winter preparation is also very simple, by moving the frames the bees will need to the center of the box, inserting insulation boards, and closing the lid.

Like a hollow tree, the openings of the box are holes – not slots and they are lined with copper because for some reason copper at the entrance seems to strengthen the hive,

but for reasons not yet known, and hopefully more studies will explain why. Using holes like in a tree makes the box easier to defend against intruders, but also helps keep the wind out better, and makes it easier for the bees to raise their brood.

Another great feature of the Thriving Hive is you can split your bees in the Spring, and still keep them in the same box. By removing the queen and some brood, and putting them on the other side of the box, you have now prevented swarming, but at the same time can run two colonies in the box for most of the year to get better honey production, while at the same time doing brood breaks to naturally control mite problems without chemicals. In the fall you can merge the bees back together just as easily, by removing one of the queens, and taking out the divider boards that kept the colonies separated.

Maybe it's time for the Hobby beekeeper to see that their needs are much different than that of commercial beekeeping, and take advantage of the differences instead of trying to make commercial practices work for them. The Thriving Hive is like "putting nature in a box", and when you give the bees what they need, it's far less a matter of will they survive, but how much will they Thrive instead!

The Thriving Hive box starts at $499 and can be purchased through the website **www.thethrivinghive.com**.

INNER COVER 2019

marks the 150th year the A.I. Root Company has been doing business in the beekeeping community. This is, without doubt, certainly something to celebrate. And while the Candle part of the company has its plans and ideas for the year, the beekeeping part of the company has a significantly more focused agenda.

The Publications Department is republishing the Autobiography of A.I. Root that he wrote after his retirement, and first published in his magazine, *Gleanings In Bee Culture*, in just over 60 chapters, beginning in 1923, the year he passed.

We will, however, be adding many photos to this new edition highlighting the beekeeping part of the business over the years with the people who made the company work, the celebrities in the bee world (and many, many other worlds) who were a part of A.I.'s life and business, and the many inventions and improvements in beekeeping equipment and management the Root Company had a hand in during those early years of beekeeping. The finished book will be available shortly, but Look for a chapter or two every month this year.

We are also starting two new sections this month, beginning with our Monthly Honey Report. Our reporters are pretty much all experienced, and successful beekeepers, who are part or full-time business people selling or packing honey, keeping bees, raising queens, even running a beekeeping business. So, who better to share with all of us what they are doing and more importantly, what they intend to do NEXT MONTH to keep their bees and opertations healthy and productive? So, take a look at the NEW second section of the Monthly Honey Report every month to see what our reporters are doing, and, more importantly, are going to do. They live in your region, need to be successful and want to help.

•

Along with this very useful feature, we are stating something similar this month, but with a slightly different slant. Each month our readers – that'd be you – will be sending in questions about– keeping bees, and almost anything related to keeping bees you can think of to ask. But rather than have those questions answered by a single voice sharing what they think should be done, considering that person's location or from the background or perspective of that individual, we are going to share your questions with all of our regular writers, who also live all over the country with a variety of different experiences and backgrounds. Some are hardcore beekeepers, some are PhD researchers, some are, well, you know who they are and where they live and what they normally write about. And, sometimes, we may go outside to find exactly the right person to answer a particular question. We know a lot of experts from articles published here, and one, maybe many may be here on occasion. Too, not every regular will have an answer to every question every month because where they live or what they do may simply mean they don't have an answer. And time, too, is a factor. We are asking all of them to help us yet a bit more each month. And that's OK. But imagine the wealth of information that this group has about almost anything you can imagine. I don't think a better collection of folks to have a BEETALK that exists. You really need to take advantage of this new resource.

This time I've used questions people have sent to me recently and passed them along to this group. But we'll need more questions next month, and the month after – so send them along to me at **Kim@Beeculture.com**, and put BEETALK in the subject line, or on the envelope's return address corner. You don't have to ID yourself if you don't want, because we just want the questions. And I know there's gotta be a thousand of them out there. Send me a question!

Of course we won't get to all of them every time (I trust we will get more than enough each month), but I'll try and pick out the most timely and forward thinking questions that are sent in. And we can save some that can be addressed down the road in a more seasonal manner.

•

Yes, BEETALK is the name of this. If you've been here awhile you'll recall that was the title of a regular column by Richard Taylor, a longtime comb honey producer, but also a college philosophy professor for several Universities, living in Ithaca, New York.

Richard wrote for us for just over 20 years. He started with a Q&A column just a bit before I started here and graduated to a more topical monthly contribution. He was a talented writer and had good beekeeping skills that he shared with our

Two New Q&A Columns. BEETALK. The Future.

readers, and the world. His beekeeping books – *The How-To-Do-it Book Of Beekeeping*, *Beeswax*, *The New Comb Honey Book*, *Beekeeping For Gardeners*, the classic *Joys Of Beekeeping*, and the collection we put together of his columns from the magazine, *The Best Of Bee Talk* all demonstrate his diverse skills and interests in bees and their keepers. And they all are collectibles.

He produced far more books as part of his other life as a Philosophy professor and teacher in several colleges. Some of his titles were fairly provocative and certainly showed his human interests. These include *Reflective Wisdom*, *Having Love Affairs*, *Good and Evil*, *Understanding Marriage*, *Virtue Ethics*, *Social Work*, *Metaphysics*, and *Restoring Pride*, among others.

He was a frequent speaker at beekeeper meetings, and his typical garb was either a straw or felt hat like the one shown in the drawing, along with a rope belt if he had trousers or white overalls if not, with a neckerchief around his neck and a simple work shirt. He was quite a character, and, I think, a bit of an entertainer.

I first met him even before I started here while I was working in Connecticut. He was a speaker at a local meeting and I was invited to meet him. I had trouble connecting the Internationally known philosophy college professor, comb honey producer, author with numerous books to this quaintly dressed beekeeper promoting Ross Rounds for comb honey production, and a basic, keep-it-simple style of beekeeping. But that was Richard. His whole approach to life, well, mostly anyway, was summed up in a saying his, by his definition, strict, mother used to say "Use it up, wear it out, make it do, or do without." And much of his beekeeping was shaped by that philosophy. It was practical, inexpensive, useful and worked well with a beekeeping life style. It still does, don't you know?

After I started here we got to know each other fairly well since he was already writing the Q&A column each month. It didn't take long to move to a regular contribution on some aspect of how he kept bees, and why and how he did what he did.

I visited him several times over the years, writing stories about his beekeeping practices, making videos and recordings of how and why he did what he did, and often, just to sit with a cup of tea and have – *BEETALK*.

I went with him to many of his beeyards over the years for all manner of reasons – to see how he wintered bees, how he made splits, removing comb honey and preparing it for sale. We often sat in his library and just talked bees, people, the Root Company, and sometimes some of the things his other books were about. It was always a surreal time for me, discussions with little input from me sometimes, but always fascinating to be a part of.

There was this one time. We were going to visit a beeyard kind of in the middle of a wooded glen. Surrounded by trees, but for about three or four hours a day sun shone in the center of that beeyard, shining on the colonies there. The road to the yard off a country two lane was a simple tire-track in the grass for about a quarter mile that opened up into this glen. We got there just as the sun was filling the opening and you could see the bees flying hither and yon by the sun glinting off their wings. Maybe a dozen colonies in a semi-circle with us driving into the center. Richard pulled up his old pickup and just sat there looking for a moment taking in the scene. Right then one of colonies on the right side of the yard more or less exploded, with bees pouring out of the entrance, rising high fast, falling faster, circling left to right and right to left, filling the space in the glen with flashes of light, streaks of blue and yellow and white and just flashes and flashes of boiling bees on the wing. If you've never seen a swarm leave a hive you should – it is a wonder to behold.

We watched for a moment, sort of transfixed by the enormous energy in front, above and beside us, bouncing off the windshield and hood of the truck.

SWARM! Yelled Richard. But he didn't panic, or jump, or run.

"Let's go watch", he said.

Without his veil he stepped out of the truck and walked into the middle of this honey bee blizzard and just stood there, watching the bees, the swarm, the fluttering wings, the flashes of light and bright and buzz. So thick you could breath in bees if you wanted, taste honey in the air and feel the wing wind on your face.

He looked left then right, down, in front and then above, and then – "Look, the queen", and he reached up and gently surrounded her with his philosopher's hand and brought her to his chest. "She's a beauty", he said, "and she still has my mark".

He held her for a time, then brought his hand to his face and wished her good luck and then let her go, up with the rest, off to find a home.

"Swarms," he said, "are a blessing and a curse. They are God's gift back to the world, but a beekeeper's beeful bane. But wasn't that a wonder to watch? To smell the bees, hear the wings, just to taste the swarm".

Well, that was BEETALK with Richard Taylor. And our new work here is BEETALK with other beekeepers. We hear your queries. We'll offer what we can.

Richard passed in 2003, and BEETALK has been quiet since then. But BEETALK is back. Let us help. Help us help.

•

A recent article in a farm magazine addresses declining commodity markets, consolidation at every level in the agriculture industry, trade tariff issues, e-commerce disruptions on normal business models, factors affecting every aspect of supply chain channels, and the overall disruption of Ag Retail Distribution in general. If you change Ag markets with beekeeping markets I don't think anybody would notice. We are one and the same it seems.

And there is this 500 pound gorilla in the beeyard that can't be evaded or ignored. Our normal business models – the supply chains that support the two colony hobby beekeeper and the 20,000 colony commercial operation, the million pound a year packer and honey importer, queen and package producers, equipment manufacturers and even importers, beeswax operations at all levels, government handouts for tariff protections and crop insurance, and even funding for government sponsored research – all have changed even since you started reading this.

When it comes to big manufac-

Beekeeping & Honey Bees

—Our Business Since 1863—

NOW OFFERING FREE SHIPPING on purchases of $100 or more. Some items do not apply.

Dadant & Sons has served the beekeeping industry for over 150 years.

From humble beginnings, our company has expanded to 10 branch locations nationwide and 4 manufacturing facilities located near Hamilton, IL.

Since 1863 we've produced and sold the best beekeeping equipment available to beekeepers throughout the world. To this day, we still believe that *"it pays to furnish good goods."*

Dadant

Online dadant.com | **Toll-Free** 888.922.1293

turers and suppliers, where once there were four, now there are two. Of course thee are still three or four medium operations healthy, wealthy and wise. But at the same time, the internet has become the seller extraordinaire for just about anything bees, except bees. You can't buy bees on Amazon (yet), but you can get them from a hundred other places on the internet. And you can buy anything you want on Amazon, cheaper than most places, delivered cheaper than most places and most likely faster than most places.

We import 80% of the honey we consume, but the whole world is looking at what we import. But too often fake honey is the name of the imported game, and sometimes the domestic game, and honey everywhere is getting a bad rap.

The beekeeping world changed this year, or, in the last two or three, depending on how you measure it. And for the first time in a long time, some beginner's classes are plateauing, even dropping.

Basically, as one manufacturer put it, beekeeping suppliers were a tiny niche market, more service providers than mercenary conglomerates looking at the profits to be made. That's pretty much what's left though. The family operation is definitely changing.

But let me tell you about those smaller operations. They still have a leg up on all of these folks, if they choose to use it, and if you choose to give them a chance. You can, certainly shop price on the net. Cheap stuff from China. Or you can buy value from the local guy, who will actually show you how to use it, and will answer the phone when you still can't figure it out. That is, if he can still get it from the diminished number of suppliers.

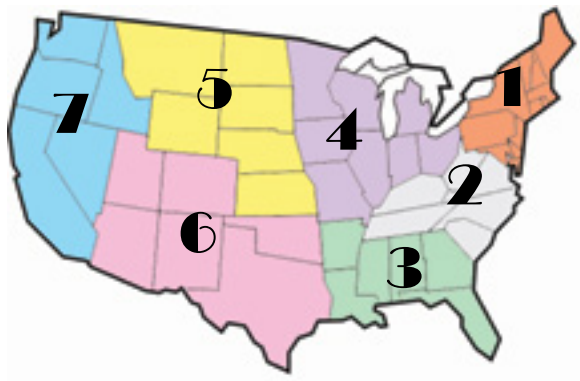
It's still a service industry. Repeat. It's still a service industry. Pay more, get more. Pay less, get less. Welcome to 2019 and our Brave New World.

If You Don't Have A Seat At The Table You're Probably On The Menu. — Elizabeth Warren

The Future Is Decided By Those Who Show Up — So Show Up, Raise Your Hand. Volunteer

JANUARY – REGIONAL HONEY PRICE REPORT

	% Yes	Regions 1	2	3	4	5	6	7
1.	Do you ever feed any of these?							
	Sugar Syrup	94	100	91	83	100	57	100
	High Fructose corn Syrup	25	20	45	50	20	43	30
	Fondant	38	30	9	50	20	0	50
	Feeding Supplement	56	60	9	0	40	43	100
	Pollen Substitute	63	40	36	85	40	57	100
	Pollen	13	0	0	17	20	28	0
2.	What IPM do you use for *Varroa?*							
	Organic Acids	62	20	45	83	60	43	67
	Essential Oils	25	30	45	0	0	28	33
	Resistant Bees	44	40	36	50	20	28	50
	Drone Comb Removal	44	20	18	0	20	28	0
3.	I belong to what Association?							
	Local	75	60	91	85	60	57	47
	Regional	44	50	64	83	0	14	65
	National	31	30	27	51	20	15	30
4.	Equipment I use							
	10-Frame	100	90	100	100	80	100	50
	8-Frame	6	20	18	32	20	0	83
	5-Frame	35	30	64	17	40	14	50
	Top Bar	12	10	9	0	0	0	16
5.	Queen Replacement							
	Buy all	50	20	27	55	40	28	50
	Buy some, raise some	50	70	55	50	40	25	50
	Raise All	25	0	18	0	20	30	18
6.	Kinds of queens							
	Russian	13	30	9	17	20	0	21
	Italian	75	60	72	83	80	57	65
	Carniolan	56	30	27	50	60	43	84
	Local/Survivor	50	50	55	53	60	43	50
	What I can get	13	10	27	17	20	0	15
	Raise my own 'Best Queens'	38	40	45	50	40	45	19
7.	I change old comb							
	Every year	19	0	9	17	0	14	50
	Every two years	6	40	9	0	60	15	0
	Every three years	44	40	91	0	40	30	0
	When damaged	69	60	100	80	60	0	65
8.	Do you test for *Varroal after treat?*	13	30	50	66	20	44	50



We asked our reporters this month a whole slew of questions about how they manage their bees. In the past we've grouped them all together so the hobby guy in Florida was grouped with the commercial guy in Washington and the packer in Ohio. That tells a story, kind of, but not a very good one. This time we grouped answers by region, showing the percent of our reporters in each region that answered yes to the particular question. And, not surprisingly, grouping the answers by region shows distinct differences in what, how, when and why our reporters do what they do. Take a look at your region and see how you fit in, but then, don't limit yourself to just your region. What are they doing next door, further north or south, east or west, and, why, do you suppose? If you have read recent articles on honey bee nutrition, you have heard the message about feeding, and for us, this is the most important question here….why don't more beekeepers trap pollen in the Summer and feed it in the Fall and Winter and Spring. Natural pollen is still the best protein you can feed, it's free and it's easy. But that's enough of that. Take a look at our information, use what you can and maybe learn a thing to two about how others keep bees.

REPORTING REGIONS	1	2	3	4	5	6	7	SUMMARY Range	Avg.	$/lb	History Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS												
55 Gal. Drum, Light	2.23	2.17	2.07	2.34	2.23	2.25	3.00	1.55-3.00	2.19	2.19	2.32	2.26
55 Gal. Drum, Ambr	2.00	2.15	1.98	2.31	2.00	2.08	2.50	1.35-2.50	2.08	2.08	2.16	2.16
60# Light (retail)	205.26	183.55	188.00	167.92	205.26	186.91	220.00	150.00-280.00	195.51	3.26	208.24	203.60
60# Amber (retail)	199.69	185.71	183.00	167.92	199.69	187.37	220.00	149.74-260.00	194.51	3.24	209.05	203.24
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	101.11	75.25	86.32	70.00	101.11	101.11	101.11	60.00-168.00	88.23	7.35	85.21	83.01
1# 24/case	129.84	106.95	117.57	110.16	127.16	113.88	148.20	84.00-192.00	121.69	5.07	126.67	126.46
2# 12/case	121.67	94.67	102.89	102.40	97.44	96.00	114.00	79.20-192.00	107.73	4.49	115.27	110.71
12.oz. Plas. 24/cs	105.57	89.75	85.33	90.00	74.40	101.40	97.20	52.99-180.00	94.64	5.26	103.07	97.13
5# 6/case	121.21	108.00	101.91	125.88	102.30	105.00	121.21	71.50-180.00	116.67	3.89	129.17	128.57
Quarts 12/case	170.56	133.83	129.67	134.40	155.32	170.56	144.00	109.20-275.00	149.01	4.14	154.13	149.02
Pints 12/case	98.94	82.69	84.80	81.00	111.00	99.94	84.00	65.00-144.00	93.39	5.19	92.42	100.74
RETAIL SHELF PRICES												
1/2#	5.28	4.47	4.60	4.63	3.87	2.38	5.28	2.38-9.00	4.87	9.74	4.90	4.90
12 oz. Plastic	6.83	5.19	5.54	5.01	4.72	5.85	5.90	3.79-12.00	5.77	7.69	5.99	5.93
1# Glass/Plastic	8.43	7.00	7.45	6.70	6.72	6.58	9.25	4.79-14.00	7.47	7.47	7.56	7.71
2# Glass/Plastic	13.09	10.64	12.93	11.45	12.09	10.13	14.13	6.39-21.00	12.49	6.25	12.73	13.44
Pint	9.86	9.33	9.49	8.33	9.00	10.50	8.40	4.00-16.00	9.71	6.48	9.85	10.65
Quart	19.75	16.38	16.47	13.58	16.28	17.00	18.58	8.00-36.00	17.51	5.84	17.61	18.06
5# Glass/Plastic	27.32	25.43	22.98	26.50	21.54	22.66	27.32	15.00-42.00	26.14	5.23	27.97	28.49
1# Cream	10.12	9.07	7.59	9.40	7.75	7.00	10.50	6.00-16.00	9.24	9.24	9.17	8.90
1# Cut Comb	13.37	9.30	12.15	10.70	10.50	13.37	14.00	6.00-24.00	11.74	11.74	12.20	11.15
Ross Round	10.02	6.63	12.00	9.00	10.02	11.00	14.49	6.00-14.49	9.79	13.05	9.48	8.83
Wholesale Wax (Lt)	6.81	4.90	5.06	5.80	6.00	3.17	7.00	3.00-12.00	6.12	-	6.99	6.68
Wholesale Wax (Dk)	5.21	4.68	4.15	4.75	5.21	3.00	5.21	2.00-9.00	4.91	-	5.93	5.78
Pollination Fee/Col.	87.48	63.75	64.00	90.00	80.00	87.48	50.00	30.00-160.00	79.95	-	85.69	78.57

NEXT MONTH

Welcome to NEXT MONTH, where our Honey Reporters share a line or two about what they will be doing this, and certainly NEXT month with their bees. Advice is given for each region so you can see what others are doing where you are, and, of course in all the rest of the regions. Check these out. These reporters are successful in business.

Region One

- Mouse guards a must. Combine weak hives, upper entrance for moisture escape. Feed sugar boards early. Leave plenty of honey.
- Wrap the hives and put candy boards on.
- Make sure hives are heavy- feed as needed. Make sure entrance reducers are in place- keep pests out. Keep beehives off of ground- too damp.
- Check for food stores. Too late for syrup. Provide fondant if necessary.
- Treat with acid. Drop or vapor. Provide ventilation and add sugar blocks.
- Wrap 4.5 lbs of sugar on top of upper cover, do not open hive. The bees will not be able to seal with propolis. Check entrance for clearance, inner opening should be open. Be sure hive is tilted a little forward to remove moisture. Close bottom screen board.
- Wraps hives-we use cozies. Extra food- honey or sugar. Wind break-Pallets on end or hay bales.
- Vent-Vent-Vent moisture kills bees!
- Wrap the hive; make sure you close off the entrance.

Region Two

- You need to treat for varroa mites and feed in the winter here. Sugar is cheaper than honey. We have to check our bees more nowadays because our weather is hot one day and cold the next.
- I make sure they have enough food for the winter. Check over the hive for condition. Close down entrance to hive.
- Weather has been very wet. Bees have not been able to build up sufficient winter storage (honey). I am feeding them to have enough food to get them through the winter. Sugar syrup only. We have had little freezing weather so far.
- Candy boards, winter patties, top pails division board feeders. Have mouse guards in place either wooden or proper size of wire mesh.
- Do not go in your hive without a good reason.

Region Three

- Check winter stores and feed light hives. A top inverted bucket feeder is what I think is the best.
- Wind break to block wind from North by Northwest. Keep bottom boards slanted downhill to keep rainwater out. Watch for skunk trouble.
- Repair equipment and seal holes in boxes inspect proper food storage. Start feeding pollen and thin syrup now.
- Control moisture/ventilation.
- You must have a source of fresh water near your colony. I use automatic water feeders which are placed near my colonies.
- Clean equipment. Buy/replace equipment if needed.

Region Four

- Make sure the hives have plenty (50lbs) of honey stores. If not I put on a candy that contains 15 lbs sugar. I dribble oxalic acid on all hives (50ml) after December 1st on first day over 50° check hives (bee yards) every 3-4 weeks to make sure "all is well".
- Since it is too late to feed syrup, try putting on candy boards. Make sure entrances are free of ice and snow.
- Winterize bees before the blizzard hits.
- If any doubt, put on a candy board. It will be food insurance for the rest of the winter. Check once a month. Replace as needed.
- If the bees are at the top of the hive, you have to start feeding them and make sure there is always food for the bees until the maple trees bloom. If the weather remains poor, keep feeding until weather improves.

Region Five

- Feed. Mouse guard. Clean combs and frames and boxes.
- It is important to check your bees during the midwinter thaw. Also add fondant or sugar boards so they will have food to help them survive until spring.
- I feed several five-pound sugar boards during the winter. I also feed pollen supplement during the Winter. I am defenseless against the small hive beetle. I treat three times for *Varroa* mites.
- Make sure Bees have enough food. If not feed sugar or Winter patties.

Region Six

- Feed sugar/syrup and insulate hive
- Leave plenty of honey at all times. Keep young Queens one or two years old. Keep a watch on *Varroa*. I believe they're instrumental in the rest of your problems- mostly.
- Have sufficient food stored so that the cluster can have access to it during prolonged cold spells.
- Clean your honey house. You'll be glad you did it now during the bees slower season.

Region Seven

- Make sure you have prepared your hives to keep them dry during the long rainy season of Winter.
- Check feed. Check mite level, medicate if needed. Will move to warmer area in December.
- Make sure hives are not in flood prone areas.
- Even with the cold rain that has set in the commercial beekeepers in the area will be performing an oxalic dribble when the daytime temperature is at least 45°F. this will really clean any *Varroa* mites that are present in the hive.

Honey Reporters Wanted

We are expanding our Honey Reporter population and need new reporters in EVERY region. We ask that you fill in most of the wholesale or retail or both sections, most months, and our short survey on the back. We give you a FREE subscription for your service. So if you are interested send an email to **Amanda@BeeCulture.com** and put REPORTER in the subject line. Include name, email, phone number and mailing address and we'll get you the next Honey Report form. Sign up today and be a part of the BEST Honey Price and Beekeeping Management Report there is monthly.

A Closer Look

Basic Honey Bee Biology

X219

$15.00

www.beeculture.com

274 pages, color

Clarence H. Collison

Betterbee®

Beekeepers Serving Beekeepers®

800-632-3379

betterbee.com

2019 catalogs are now available! Call or visit our website to request your free copy.

Visit us at booth 230 at ABF in Myrtle Beach on January 8-12!

LYSON

- **Lyson polystyrene hives** have durable plastic frame rests and adjustable ventilation
- **Polystyrene is lighter than wood** and provides increased insulation against both the cold and heat

300+ Lyson products available!

Lyson Complete Beginners Kit
LYBKA

Lyson Polystyrene Hive
LYHEW1103K

Lyson 6 Frame Nuc Box
LYHEW1130K

BJ SHERRIFF

EST. 1968

- **Specialty made** fine beekeeping apparel
- White in stock at Betterbee, but **available in 13 colors** by special order, in child and adult sizes

New year, many new products available at Betterbee!

BEE TALK

Welcome to BEETALK, Where Bee Culture Answers YOUR questions. Got a question for our regular writers? Send it to me, KIM@BeeCulture.com, and I'll send it to all of our regulars. So we'll provide an answer that will come from this or that part of the country, or from a beekeeper, a bee researcher, or a bee business person. You'll get all kinds of Perspectives to the question. All kinds of experiences, all kinds of locations, all kinds of answers. It is, quite simply Beekeepers having a BEETALK. What could be better, and who better to answer your questions! Send in your questions to me, at KIM@Bee-Culture.com, and put BEETALK in the subject line. That's all it takes to be part of the grandest BEETALK you can imagine.

Question 1

Last season was dry, dry dry and hot, hot, hot in many places, but especially where I am on the west coast. But the weather people are predicting the same in many places again this Summer – west, southwest, Midwest and southeast. What can we do to help our bees get through another tough season?

Eliminate the bee stresses that you can. Keep *Varroa* under control. Make sure your little darlings are well nourished. Place your hives in the shade, if you can, or paint them white to reduce solar gain. *Ed Colby, CO*

Always have a source of water in the beeyard or very near the hives. Monitor forage areas frequently to see what plants are blooming. Don't hesitate to feed 1:1 sugar syrup to keep colonies alive. A honey crop may not be possible this year. *Ann Harman, VA*

Speaking for both Alabama and Ohio, each in different climates, a dependable water source should be constantly available. Ideally, it should be located nearby, but something like a pond that is a bit of a flight from the colony would be great. Various entrance shading devices or ramadas could be helpful to both the bees and the beekeeper. Many years ago, a beekeeper unknown to me said, *"If you're comfortable, your bees are comfortable." Jim Tew, OH & AL*

Here in New England we often have too much rain, rather than not enough. Unfortunately, when it is dry, dry, dry and hot, hot, hot the best I can do is feed, feed, feed. *Ross Conrad, VT*

Provide shade and water and feed if necessary. *Jay Evans, DC*

We moved some of our bees to places that normally are slightly more inhospitable due to various microclimate factors. One example is moving them near ponds where typically the temperature inversions make it colder and wetter than is preferred, but in hot and dry seasons it works well for them. *Jessica Louque, NC*

Bees are able to handle tough weather conditions but may need our assistance a bit more during these times. For instance, dry and hot conditions will mean a decrease in nectar and pollen production. Bees will more than likely need to be fed both. They will also need access to a natural or provided water source. *Jennifer Berry, GA*

Question 2

How often should I be doing the alcohol wash test for *Varroa* mites?

If your bees are relatively mite-free in the Spring, and you continue checking once a month through the Fall, you've done due diligence. But remember! In the *Varroa* world, inconsistency is the rule! But watch for the one that explodes. *Ed Colby, CO*

One test should be taken as early as possible. If you plan on a treatment, one should be taken after the treatment to judge the effectiveness. It is also important to sample at a time when Winter bees are being produced to assure that the Winter bees' fat bodies will not be depleted. *Ann Harman, VA*

The schedule of alcohol rolls for *Varroa* detection depends on the individual beekeeper. Some depend on the regular use of this procedure throughout warm months, while others use it less frequently and assume that if they do not treat, they will have troublesome *Varroa* populations. I would not go crazy killing bees to save bees. Use it frugally and on your schedule. *Jim Tew, OH & AL*

Checking for *Varroa* mites should start in early Spring, both on overwintered hives or bees bought from packages. The first evaluation should be done in June, evaluating at least 10 percent of colonies. If the apiary is small (less than 20 hives), sampling five colonies gives a decent sense of mite pressures. If you have fewer than five hives, test them all. Act immediately on a threshold level of two Varroa mites per 100 bees in May or June, and three mites/100 bees in July, August, September. Further information about the importance of monitoring and alternates to alcohol washes can be found at **https://bip2.beeinformed.org/state_reports/, and https://pollinators.msu.edu/resources/beekeepers/varroa-mite-monitoring1/**, respectively. Check out pollinators.msu.edu. The two minute rest period is a very important step. It is during this point that the mites are releasing from the bees. Make sure that you let the bees rest for at least two minutes. Check **bip2.beeinformed.org**. *Jay Evans, DC*

We do once a month (when it's not cold) unless we visually see an issue, the counts are higher, or we've recently treated and want to make sure it worked. In those cases, weekly until you see results of some kind. *Jessica Louque, NC*

Once a season is usually good, but definitely Spring and Summer when mites are at their height of reproduction. If mite loads are too high going into Fall, then bees being reared for overwintering survival will more than likely be infected with viruses. It's the viruses that are killing our bees, especially during the Winter months. *Jennifer Berry, GA*

Question 3

I had a lot of small hive beetles last year that caused me all kinds of grief. What can I do now, in January, to get ahead of this problem?

The small hive beetles will not start increasing their numbers until the weather warms sufficiently for larvae to leave the hive to pupate. We have kept them under control with wintergreen oil, three drops on a paper coaster placed on top bars. In addition, six free-range chickens have been a big help. *Ann Harman, VA*

I continue to be both uncomfortable and uncertain about Small Hive Beetle (SHB) recommendations. While not much of a problem in Ohio, SHBs torment too many Alabama keepers. The recommendations are little more than common sense. Keep the colonies strong. Don't overwork the colonies. Avoid deep shade. Use various beetle traps. Maybe use microfiber cloth, but that may not be a truly useful recommendation. I cannot specifically say that there is a way to get ahead of the small hive beetles at any time of the year. Presently, I have not heard of a good control procedure that is completely dependable. *Jim Tew, OH & AL*

I would purchase a bunch of SHB traps and have them ready to go when spring arrives, and I would plan on keeping the bees crowded on their combs by only adding a new super once the colony has filled most of what they have and have a large enough population of bees to fully cover all the comb in the hive. *Ross Conrad, VT*

Small hive beetle (SHB) overwinter inside the hive as adults in the honey bee cluster, and not much can be done to trap or remove them in Winter. Fortunately, they do not lay eggs in Winter, so will not enter a growth spurt. If SHB are evident in the hive early in Spring (they can be monitored by traps or just careful scans of top bars and frames), the best strategy is to fill as much of the hive space with bees, who will be diligent against SHB. If this is not possible and numbers continue to climb, and especially if SHB larvae are observed, more drastic steps should be taken, including freezing frames with SHB larvae, scraping bottom boards, and squishing adults with hive tools. Chemicals can be used as a last resort. *Jay Evans, DC*

Combining smaller hives now gives the best chance because a tiny hive gives a lot of hiding room for beetles over the Winter. You could also move your colonies to a distant location so that anything pupating in the ground is not near your hives when they emerge. *Jessica Louque, NC*

The best thing we have found that helps keep SHB's at a minimum, is keeping our colonies in the full sun. If I had a problem with beetles this year and they were not exposed to plenty of sun, I would be finding a different, more sunny location to move my bees. January is the perfect time to move colonies. Here in Georgia when the winter winds aren't blowing too hard, we install beetle traps with oil, (Beetle Jail being our favorite), close to where the bees are clustering. Beetles overwinter in the cluster but still need a place to hide out away from the bees. Beetle traps in close proximity to the bees is a perfect place to catch, trap and kill beetles. *Jennifer Berry, GA*

Question 4

What kind of queens do you like best? Italian, Russian, Carniolans, local mutts, some other kind? And Why?

I buy my queens, and in general I prefer Carniolans for our Colorado climate. They tend to overwinter in a smaller cluster than Italians, which means they eat less in cold weather. They can still come out swingin' in the spring. However, the most important thing is not the subspecies of *Apis Mellifera*. The most important thing is to buy queens from a reputable breeder whose queens pass on some degree of mite resistance. Ask before you buy. *Ed Colby, CO*

Ankle-Biters and Mite Maulers from a local breeder are quiet on the comb and productive. In spite of this year's extremely poor forage from incessant rains they were able to go into Winter with adequate stores. *Ann Harman, VA*

I like using good, hi-bred queens, but I do not require them. Great queens require great swarm management. Great queens require an abundance of healthy bees of all stages, great foraging sources. I will sometimes specifically use a particular type of queen – primarily for observation. Like wine, the same great queen source may not the be same next season. If I find a colony to be queenless, I may be reduced to using a queen – any queen – to alleviate my immediate need. Consequently, I tend to use different types of queens for different purposes. *Jim Tew, OH & AL*

I do not judge my queens based on race, but on their character. Generally, I find locally raised queens that are naturally mated, but can trace their heritage back to disease and mite tolerant stock are best, and the research suggests this is the case as well. *Ross Conrad, VT*

All races of bees have traits that beekeepers find desirable. Given that honey bees are facing a lot of pressure of pests and diseases, the best choice is to purchase healthy, well-mated queens from a breeder who is aiming for genetic resistance to mites and disease. We are trying to establish local mutts by requeening with resistany stocks from all over and occasional grafting in-house. *Jay Evans, DC*

Carniolans are my favorite because they're black and the easiest for me to find. Locals probably overwinter the best though. Italians are my most common because that's the packages we buy in bulk. *Jessica Louque, NC*

I've always preferred to purchase and rear mutts or mixed lines/races. Selecting for a line is fine, but I prefer ones that are selected for specific traits such as gentleness, production and longevity over a particular "line" of bees. *Jennifer Berry, GA* BC

A SON'S MEMORIES OF A.I. ROOT

Suggested by the last days and religious characteristics of his remarkable father.

Ernest R. **Root, 1923**

A.I. Root was born near Medina, Ohio, Dec. 9, 1839. He rested from his labors April 30, 1923. The funeral, which was held in Medina May 2, was not a funeral in the ordinary sense of the word. Everyone who spoke seemed to feel that A.I. Root was not dead but that his "soul was marching on." Not a tear was shed while the eulogies by the prominent men were being pronounced. So far from being a time for sorrow it was a time of rejoicing over his triumphal entry into the new life that would go on forever.

After the Y.M.C.A. quartette sang one of Mr. Root's favorite hymns, "From Sinking Sands He Lifted Me," Dr. Drew, his pastor, read some appropriate scriptures and then told of Mr. Root's love for home church. Dr. H.S. Fritsch, a former pastor, spoke of the help and inspiration he had received from his departed friend; of how A.I. Root's "amens" during the sermon used to cheer him; of how, if he did not get these, he felt that there was something seriously wrong with the sermon.

Dr. Howard H. Russell of Washington, D.C., founder of the Anti-Saloon League, told how as a student at Oberlin College, encouraged by his classmate Ernest, he had come to see A.I. Root; of how the latter, with Mr. Metcalf, favored the League in its struggles for existence for the first two years; of how, for years afterword, his prayers and his money had helped to make the League the great power that it now is.

The Y.M.C.A. secretary, Mr. Barnes, then sang "I Shall See Him Face to Face." It seemed as if A.I. Root's hope of years as expressed in the hymn was at that very moment being fulfilled.

J.A. White, superintendent of the Ohio Anti-Saloon League, the man who had put Ohio across with 189,000 majority against light wines and beer at the last election, told, as had the others, of how he had been helped by A.I. Root's personality and prayers.

Ex-Congressman Judge A.R. Webber, a lifelong friend and admirer of A.I. Root, called attention to the fact that A.I. Root still lives in spirit and influence. The papers said John Brown is dead; but in the language of the immoral song, "his soul is marching on."

The last speaker was the Rev. Mahlon Woolf, who said he had been led to Christ and into the ministry largely through A.I. Root's influence; and then brought out the point that his old friend was a personal soul-winner; that he somehow found it easy and convenient with a new-found friend to open the way to Christ.

Thus closed a funeral that was impressive but not sad.

Early Days Before His Conversion

Writing of his conversion I shall tell of the steps that led up to it, for it was not a sudden entrance into the kingdom, but a growth. I am recording these facts so others who are not "finished products" may see the process by which God sometimes uses some of his children who are not perfect.

A.I. Root was a frail child. As a man he was never strong, often ailing, and particularly sensitive to a cold. Naturally with an active mind that pushed his frail body beyond the limits of his strength, he was of a nervous temperament. If in the early days, things did not move as fast as he thought they should (and there was not one person in ten who could keep up with his fast pace), some one was likely to be pushed along in an unceremonious way. With a voluminous correspondence that demanded his personal attention, a bee journal, and a factory

of employees, it is not surprising that he became nervous. He undertook a work clearly beyond his strength. His impetuous nature caused him to step on the toes and heels of his associates because they could not move fast enough.

When A.I. Root was 18 he went on a lecture tour in which he actually paid his own way without calling on his father for a dollar. With a full beard at 18 he passed muster for a much older man, styling himself "Prof. A.I. Root." In later years he took no pleasure in this "handle" to his name. After his lecture tour, when he came back to the old farm he became interested in repairing clocks and watches. He took a course in watch-repairing, and at the age of 21 started a watch-repairing shop under the pretentious name of A.I. Root & Co. It is needless to say that he was the whole thing, "company" and all.

He read everything he could get hold of in each one of these lines of activity, and talked with every one who could give him any information. When he got to riding other hobbies such as beekeeping, gardening, windmills and publishing a bee journal, he showed the same intensity of spirit that enabled him to master everything he undertook, and the strangest part of it was that he made all of these hobbies pay dividends not only in experience but in actual money.

His lecture tour, the first of his independent enterprises, paved the way and gave him experience with the world and mankind in particular that was invaluable. His watch-repairing business paid; his jewelry-manufacturing business paid; his bee business paid; his gardening paid. Carrying on all these lines of work, his mind was constantly reaching out to new fields of activity.

As a child, when he was frail and slender, he contracted lung fever, or what is now called pneumonia. The neighbors said that, had it not been for his good mother, he would have died in his early attack, and the world would have lost not only a genius but a benefactor.

His Thorn in the Flesh

A.I. Root in the early days was, as stated, a nervous and sickly child. He had a quick temper; when things did not go right he would fly into a passion. He grew up to manhood, drifted away to some extent from the church and Sunday school of his mother, and into skepticism and doubt. While he was thus drifting, his mother and his wife were praying for him. I remember how on Sunday he and I would walk down to the farm, two miles away, to talk with his dear old sainted mother. I well remember, as we walked back, how he pondered on his mother's words, and how careful he was not to fill me up with notions of skepticism.

During all this time he was building up a jewelry business till he was melting 200 silver dollars in a day for his "raw material." The cares of business were becoming heavier; his work began to multiply; there was a struggle in his nature between the skepticism of Ingersoll and Tom Paine and the religion of the Lord Jesus Christ as taught him by his mother. His occasional outbreaks of temper made him fear that he would have to change his mode of thinking and his habits of life. After one of his outbreaks, seriously fearing that the uncurbed habit would lead to something serious, he concluded, after a talk with his mother, that the only way to cure it was by giving himself unreservedly to the Lord Jesus Christ.

In some respects his conversion was like that of Paul's, with this difference: that there was no miraculous manifestation of any sort. It was a complete turnover from the old life to the new. The change was so sudden that his friends remarked it. A.I. Root did not hesitate to tell the world that he had found a new way. With all the intensity of his make-up, with that bubbling enthusiasm that manifested itself throughout his life, he seemed eager to have the world share with him his new-found Lord.

I remember the first morning after the change had taken place; he seemed to feel that to become a Christian meant a complete turnover then and there. He was going to do the things that a Christian was supposed to do. I remember the first time he said grace, of how in a halting voice, he asked God's forgiveness and help, how he asked that the old doubts should be dispelled and particularly how he asked that God might help him to live as a Christian every day of his life.

It was noised around the country that A.I. Root had become a Christian, and he was asked to speak at a number of the churches, an opportunity that he readily accepted. And then when his old-time friends of the Tom Paine and Bob Ingersoll persuasion joked him a little, he would come back with that simple faith of his and tell them that he had found something that was infinitely better, that satisfied as nothing else ever did.

Almost immediately after his conversion, A.I. Root took up Sunday-school work. He had a class of boys that had become so unruly that nobody apparently could do anything with them. Some of those same boys today are professing Christians, and one of them was for 10 years a missionary in China, the boy who said he was the "hardest" one of the whole lot to control.

But taking up ordinary church work was not enough. A.I. Root went out into the byways and hedges and established Sunday schools. One of those schools in particular became such a power for good that it put a near-by saloon practically out of business. The proprietor

told him that if he didn't quit that Sunday school some dire things would happen to him, but A.I. Root went on just the same. And the saloon closed.

A little later Mr. Root had a Sunday morning Sunday school before church, made up of employees, and still later he had what he called his "noonday services" in the main office. Every day the employees at 10 minutes before 12 would assemble. One of the gospel hymns would be sung, there was a reading of scripture, a talk and then finally a prayer by A.I. Root. Some people called them "noonday prayer meetings." Call them what you like, they enabled A.I. Root in the early days to harmonize all difference that might exist between him and his employees.

But he found he could not break that temper in a day. For some time after he became a Christian that same old thorn in the flesh would trouble him. Even after he sold out his jewelry business and went into the manufacture of beekeeper's supplies and publishing a bee journal, he had a constant struggle with that temper that was the direct result of overwork and of having too many irons in the fire at one time. During this time, from 1875 to 1883, he went through some financial difficulties that would have killed most men; but that irrepressible spirit of his to conquer self, sin and the world could not be downed. His biggest fight was with himself.

On one occasion he had written a Home paper on the text, "Great peace have they that love thy law, and nothing shall offend them." The next day everything seemed to go wrong. He was irritable; and when one of his clerks quoted the text because his mood showed anything but "peace," he humbly begged the pardon of all of them. They knew that, with his weak body, he was doing the work of vigorous men.

It was not until the period between 1890 and 1895 that he began to let go of his business. Then it was that his impetuous nature began to soften down until he was at peace with all the world, and nothing could offend him. But this did not come until after a long, long struggle.

Most men, had they gone through what A.I. Root did with his weak and overworked body, doing the work of five men, would possibly have cursed God and man, and given up the fight. It is remarkable that, through all of those strenuous days, he should have been even as calm as he was.

He was so broken in health that it became necessary for him to take long rests, spending the Winters in Florida and his Summers in Michigan, throwing the responsibility of handling the business over on his sons and sons-in-law. He made a trip to California in 1891. It was during these rest-periods that he regained his health and with it that quiet spirit that dominated his later life.

Lived in Attitude of Prayer

In his later years A.I. Root was almost constantly in the attitude of prayer. He spoke often of "God's gifts." If he found a new plant or shrub it was "God's gift." Frequently through his waking hours he would say, when anything pleased him, "Praise the Lord!" It was spontaneous. He was so full of love of God that he said "Praise the Lord" anywhere and at any time. If a nice shower came he would say, "Thank the Lord." When the sun shone it was "Thank the Lord." When I met him at the Cleveland Union depot on his last trip from Florida he called out in his delight, "Praise the Lord!" and when I took him down to the lunch counter for some hot milk and milk toast he said, "Praise the Lord!" The waiters smiled at this little old man, and wondered. It was in this way in public places he would unconsciously start people to thinking seriously about God.

He had another little prayer, just as spontaneous – "Lord, help!" It was his favorite prayer when he needed something, and which lifted his burden from him. He used it in the big and little things of life. When he and I were motoring down to Florida two years ago last fall we got stuck in the Georgia mud, he uttered the little prayer, "Lord help!" not once but several times: I thought I needed men and mules. We were badly stuck, with the rear wheels sunk below the hubs. I went after a span of mules and some men. It took four mules and eight men to get us out. As soon as we got on hard ground father said, "Thank the Lord!" I was covered with mud. The mules had broken the door and smashed the guard of a new machine, and as I was in anything but a prayerful mood, I said "It was the four mules and the eight men that got us out – not the Lord."

"Yes," persisted father, "but the Lord helped you to find the men and teams so quickly. We ought to praise Him that the machine is no worse than it is, and that we can now go on."

And so it was with father, "Praise the Lord." That little prayer, "Lord help!" was indeed a great help to him, and the Lord did help in ways that seemed almost uncanny as his autobiography will show.

A.I. Root's Last Days

When A.I. Root wrote the Home paper for May he said to his daughter, at the time, that this might be his last one, and that he thought he had finished his lifework. When I brought him home from Cleveland on his return from Florida I could not help thinking the conversation between the disciples in that walk to Emmaus when they said, after the disappearance of the Master, "Did not our hearts burn within us while he talked with us by the way?" and so I, too, thought as we rode. As I look back, I see that father was telling me, not directly but indirectly, that he was going soon, notwithstanding that he expressed himself as feeling remarkably well. He spoke of the Lord Jesus Christ; of his hope concerning the hereafter; of meeting mother, or "Sue," as he always called her, and of his abiding faith in prayer.

As he talked I took him back by the long way, for I was enchanted by his words. I was impressed by the feeling that, if there was ever a man in these later days who walked close with God, who knew God and who loved God, that dear old father of mine, whom you know as A.I. Root, was one of them. His words were those of benediction, of love, and of affection; and my brother Huber, after an hour's talk with him the day before he was taken sick, was impressed with the same thought – the love of God. God seemed to reveal to him almost the day when he would give up life's work.

A.I. Root's Last Hours

He seemed to be in good health Friday, the 20th. On the 21st he was taken with a slight cold. He had often had these ailments, and so we thought little of it. On the following Sunday my sister, Mrs. Calvert, was a little concerned as father became worse. As the days went by we called a special nurse. I told father the time had come when we wanted to give him the best care – that we thought a trained nurse would be necessary. We thought he would object; but he said, "Just as you say." After she arrived he said, "Praise the Lord! Indeed you have given me a good nurse; and the best part of it all is, she is a lover of the Lord Jesus Christ."

Let me digress right here a little. One of the prominent characteristics of A.I. Root was the tactful and beautiful way in which he would find out from a newfound acquaintance whether he was a Christian. Some people, with the best of intentions, will give offense, but never A.I. Root. If a certain one should say he was not a Christian he would enter a very gentle plea; and the result has been traced in numerous cases when these same people remembered A.I. Root's words, and later would give their hearts to God.

In the same beautiful way father had a happy faculty of rebuking boys when they used profane language; but in doing so there was nothing that could give offense. A gentle smile and a kindly look from the eyes of that man of God would somehow grip everyone who came in contact with him. But to return.

On Sunday he seemed a great deal better. I took care of him while the nurse was resting. Suddenly, he roused up, turned to me and, looking straight into my eyes said with a bright look, "Is this Ernest, my first-born?" He often addressed me thus.

When I assured him he said, "Thank the Lord." He then paused a moment, and in a somewhat feeble voice said, "Praise the Lord. He has delivered me from" – I could not make out what he said; but I thought he said it was "from death." I now think he meant the fear of death. A little later he was resting quietly, and I went home with the belief that the crisis had passed. But about three o'clock on the morning of April 30 the nurse saw that he was getting weaker and sent word to all of us; but before we could get to his bedside his spirit had gone to its eternal rest. He died quietly, just as though he had fallen asleep.

I can not close without quoting an editorial from the Medina County Gazette, By W.B. Baldwin:

Amos I. Root

Amos I. Root was one of the most remarkable men of the past two generations, remarkable not in one way, but in many ways. His was a many-sided character, if any man ever had one. Inventor, writer, manufacturer, publisher, thinker, philanthropist, reformer, moralist, agriculturist, Christian. In all of these his character was marked and he was a leader. In most of them he loomed large. Even as an agriculturist, he tilled the soil in a modest way, yet as in everything else he excelled in this, for he not only made two blades of grass grow where only one grew before, but he was gifted with the ability to make things grow where they had never grown before. In many ways his reputation was world-wide.

But what was best about him and his works and his life was that whatever he put his hand or his mind to, it was with the idea of benefiting humanity. And it can be truly said of him that the world was better for his having lived in it. He did not live for himself alone – or he would not have lived as he did –but unselfishly and whole-heartedly he lived for others, for his family, for his friends, for his employees, for his neighbors, his fellow townsmen, for humanity. And he did much to make them all better and happier.

But if there was one characteristic that stood out above all others, it was his absolute sincerity in everything that he did or undertook. No amount of scoffing or ridicule – and he endured it many times – could swerve him from his belief or purpose and he went straight to his work without faltering or swerving from the path he had chosen. Nor was he above admitting it when he found out he was wrong or in error.

Although he retired many years ago, from active management of the business that he founded and made a success, he did not retire from an active life; but he continued to move among us, brain and hands always active, easily the leading citizen of the community, as he was the most widely known – for his works and name went to the uttermost parts of the earth – but he is mourned not so much as a public personage, but as a gentle, lovable, God-fearing, man-loving, charitable character. Though dead, his influence will go on and on. The prayers of a grateful and loving community follow him to the better world. BC

ULTRA BEE

HIGH PROTEIN POLLEN SUBSTITUTE

READY-TO-FEED PATTIES

SALE

FOR HEALTHIER, STRONGER, LONGER-LIVING BEES

Scientifically developed to provide the best bee nutrition, Ultra Bee has been shown to match natural pollen's results in the field. Give your bees the nutrition they deserve - feed them Ultra Bee.

- **Highest protein content available**
- **Balanced amino acid profile**
- **Pre-made patties ready to use, just place on top bars**
- **USA ingredients only**
- **FDA certified**

FD-374 Ultra Bee Patties
10 lb box.....$30.95

FD-375 Ultra Bee Patties
40 lb box 1-3 boxes.....$78.95
4-10 boxes $72.95
11-48 boxes....$68.95
49+ boxes.....$65.95

FD-376 Ultra Bee Patties
Bulk Pack 2100 lb.....$2595.95

MANN LAKE
WE KNOW BEES

800-880-7694
www.mannlakeltd.com

Hackensack, MN • Wilkes-Barre, PA • Woodland, CA • Marshall, TX

*Free shipping applies to most orders over $100 sent standard ground service within the lower 48 states. Prices effective 1/1/19 thru 1/31/19 and are subject to change without notice.

A Closer LOOK

VARROA MITE DISPERSAL

Clarence **Collison**

Varroa mites can disperse and invade honey bee colonies by attaching to "drifting" and "robbing" honey bees that move into nonnatal colonies.

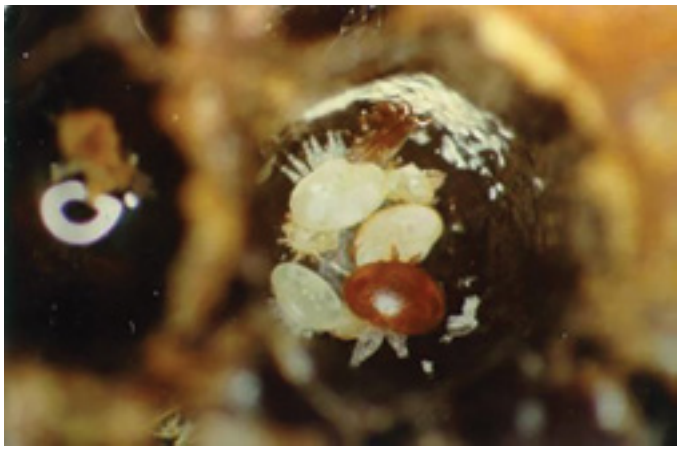
The *Varroa* mite life cycle consists of two distinct phases: a phoretic phase during which the females stay on adult bees and feed on hemolymph (blood), and a reproductive phase taking place inside of capped bee brood cells. During the phoretic stage, the mites frequently switch among adult bees. Phoretic behavior or phoresy is involved in mite dispersal. Female mites "hitch a ride" to other hives through the aid of adult bees (Martin 2001).

Varroa mites can spread through the bee population both vertically and horizontally. Vertical transmission occurs when colonies cast reproductive swarms, and the phoretic mites travel upon the swarming bees to the new nest site. Horizontal transmission of mites between colonies is thought to take place primarily through drift of bees into colonies other than their own, robbing of honey stores from weak colonies by stronger ones, and the movement of infested brood or bees by beekeepers (Peck et al. 2016).

Infested colonies weakened by the activities of the mite are prone to robbing by other stronger colonies. Mites can be transferred into the robbing colony via the robber bees picking up the mites or infested robbed bees which desert their hive and return with the robber bees. Bees have long been known to drift from hive to hive, especially the drones which may visit many hives during their lifetime and appear to be excellent dispersal agents for the mite. When any infested colony swarms, both halves of the colony will contain a proportion of the mite population. Dispersal rates appear to be linked to a combination of mite buildup and changes in bee behavior, with peak dispersal occurring in the Fall in northern temperate regions. This corresponds with the peak in mite numbers and peak in robbing activity due to the lack of nectar flow. Since at this time there is little brood production, the majority of mites will be on adult bees.

Varroa mites can disperse and invade honey bee colonies by attaching to "drifting" and "robbing" honey bees that move into nonnatal colonies. Frey and Rosenkranz (2014) quantified the weekly invasion rates and the subsequent mite population growth from the end of July to November 2011 in 28 honey bee colonies kept in two apiaries that had high (HBD) and low (LBD) densities of neighboring colonies. At each apiary, half (seven) of the colonies were continuously treated with acaricides to kill all *Varroa* mites and thereby determine the invasion rates. The other group of colonies was only treated before the beginning of the experiment and then left untreated to record *Varroa* population growth until a final treatment in November. The invasion rates varied among individual colonies but revealed highly significant differences between the study sites. The average invasion rate per colony over the entire three to five month period ranged from 266 to 1,171 mites at the HBD site compared with only 72 to 248 mites at the LBD apiary. In the untreated colonies, the *Varroa* population reached an average final infestation in November of 2,082 mites per colony (HBD) and 340 mites per colony (LBD). All colonies survived the winter, however, the higher infested colonies lost about three times more bees compared with the lower infested colonies. Therefore, mite invasion and late-year population growth must be considered more carefully for future treatment concepts in temperate regions.

Inter-colony distance of *Apis mellifera* significantly affects colony numbers of the parasitic mite, *Varroa*



destructor. Nolan and Delaplane (2017) set up 15 apiaries, each consisting of two colonies. Each apiary pair was assigned an inter-colony distance of 0, 10, or 100 meters. Colonies were rendered nearly mite-free, then one colony in each pair was seeded with 300 female mites (mite-donor colony), while the other remained uninoculated (mite-recipient colony). After four months of monitoring, a whole-model analysis showed that apiaries in which colonies were spaced 100 m apart contained lower average mite numbers than 0 or 10 m apiaries. There were interactions among colony type, distance, and sampling date; however, when there were significant differences, mite numbers were always lower in 100 m apiaries than 10 m apiaries. These findings pose the possibility that *Varroa* populations are resource regulated at a landscape scale: near-neighbor colonies constitute reproductive resource for mites in the form of additional bee brood.

Kralj and Fuchs (2006) confirmed that infestation by *Varroa destructor* is lower in foragers returning to the colony than in those leaving the colony and explored causes of mite loss. Video recordings of bees at the flight entrance revealed that some mites may get lost from foragers but also showed that infested bees stay outside the colony longer. Returning test of foragers released at some distance of the hive confirmed that infested bees take a longer time to return or do not return at all. The loss of foragers per flight was higher in a highly infested colony compared to a less infested colony. In a visual orientation test at the hive entrance infested bees scored lower, indicating impaired orientation abilities. The results show that infestation by *V. destructor* mites influences the flight behavior of forager bees, to the effect that foragers might not return to the colony. This is interpreted as an adaptive behavior of the bees to remove the parasites or pathogens from the colony.

Mites are hypothesized to spread between most managed colonies via phoretically riding forager bees when they engage in robbing colonies or they drift between hives. However, widely spaced wild colonies show *Varroa* infestation despite limited opportunities for robbing and little or no drifting of bees between colonies. Both wild and managed colonies may exchange mites via another mechanism: floral transmission. Peck et al. (2016) tested the ability of mites to infest foragers at feeders or flowers. They were able to show that *Varroa* mites are able to rapidly infest honey bees foraging at a feeder or at flowers of several species. Their observations reveal that mites can quickly mount honey bees engaged in foraging and that despite efforts by the bees to groom off the mites, they almost always succeed in leaving the forage site still attached to a bee. *Varroa* transfer from flower to bee can occur in just two seconds of foraging activity on a flower. It is not yet clear how significant this mode of transmission may be for mite spread between colonies because little is known about how frequently mites wind up on flowers. This study examined only the transfer of mites from flowers to bees but not from bees to flowers.

Drones may also play a role in *Varroa* mite dispersal. Drones were collected and the number of *Varroa* per 100 drones was calculated for each of five drone congregation areas (mating sites). This study is the first to confirm that drones present at drone congregation areas do carry *Varroa*. Further experimentation is needed to determine the extent to which drone-mediated movement may play a role in *Varroa* life history and/or to develop practical management strategies to limit drone-mediated movement of *Varroa* between honey bee hives (Mortensen et al. 2018).

Seeley and Smith (2015) showed that the crowding of colonies in an apiary can boost the drifting of drones between colonies. It also suggests that this crowding can lead to healthy colonies suddenly acquiring lethal infestations of *Varroa* mites when other colonies in the same apiary are dying from high levels of *Varroa* mites and viruses. By showing that differences in colony spacing, even on a small scale (ca. 1 meter vs. ca. 30 meters), can strongly influence the mite infestations of colonies, this study complements the Frey and Rosenkranz (2014) study that showed that differences in colony spacing on a landscape scale (in regions with low vs. high colony densities) can strongly influence the mite infestations of colonies. In the Seeley and Smith study, when colonies were housed in ways that are typical for apiculture – hives painted the same color, arranged in a row and facing the same direction, and spaced tightly – it was found in both years that approximately 35% of the drones entering each colony's hive did not match the color morph produced by the colony. Clearly, there was a high level of drones drifting among the crowded colonies. In contrast, essentially, no drifting of drones was found among colonies in the dispersed group, which were housed in hives that were identical to those in the crowded group but were spaced more widely.

This Seeley and Smith study also shows that swarming can strongly affect the infestation levels of *Varroa* mites in colonies in apiaries, and therefore the survival of these colonies. In both the crowded and dispersed groups of colonies, it was found that the colonies that did not swarm and those that did swarm started the summer of 2012 with similar mite drop counts. It was also found in both groups that once the colonies that swarmed did so, their 48 hour mite drop counts and their counts of mites/300 bees fell to 15-20% of the level of the counts for the colonies that did not swarm. It seems likely that the mite infestation levels dropped markedly in the colonies that swarmed because when a colony casts a swarm, it loses 40-70% of its worker bee population (Wilde et al. 2005; Rangel and Seeley 2012) and since approximately 50% of the mites in a colony are on the adult bees (Fuchs 1985), this means that a colony loses 20-35% of its adult mites each time it swarms.

Furthermore, because a swarming colony can cast

multiple swarms – one primary swarm and sometimes several afterswarms (Gilley and Tarpy 2005) – swarming can greatly reduce a colony's mite population. Besides quickly exporting many mites from a colony, swarming might also lead to a more protracted process of mite removal because swarming creates a period lasting one to three weeks when there is no sealed brood in a colony. This period without sealed brood arises because whenever a colony swarms, and the mother queen leaves, it takes the replacement queen one to three weeks to emerge as an adult, kill her rivals, get mated, and begin laying eggs. During this period without sealed (pupal) brood, the mites can neither reproduce nor hide in cells containing pupae; consequently, they will suffer a decreased birth rate, and they may also suffer an increased mortality rate, being vulnerable to getting bitten by bees and groomed off them (Arechavaleta-Velasco and Guzmán-Novoa 2001).

Movements of the parasitic honey bee mite, *Varroa jacobsoni* (Oud.) were monitored in several assays as they moved among adult host honey bees. Kuenen and Calderone (1997) examined the propensity of mites to leave their hosts and to move onto new bee hosts. They also examined their preference for bees of different age and hive function. Mites were standardized by selecting mites from newly emerged worker bees (NEWs). In closed jars, 50% of *Varroa* left NEWs irreversibly when no physical path was present for the mites to return to the NEWs; about 90% of mites left newly emerged drones in identical assays. In Petri dish arenas, mites were rarely seen off NEW hosts when monitored at 15-min intervals for 4 hours; this was the case for single NEWs with one mite (NEWs+) and when a NEW+ and a NEW- (no mites) were placed together in a Petri dish. When a NEW+ was held with either a nurse bee or a pollen forager, 25% of the mites moved to the older bees. When both a nurse and a pollen forager were placed in a Petri dish with a NEW+, about 50% of the mites transferred to older bees; nurse bees received about 80% of these mites, whereas pollen foragers received significantly fewer mites (about 20%). Most mite transfers occurred during the first 30 minutes after combining NEWs+ and test bees. When NEWs+ were combined with bees of known ages, rather than function, mites transferred more often to young bees than to older bees (one- and five-day-old bees vs. 25-day-old bees; one-day-old vs. 13- and 25-day-old bees). No differences in proportions of transferring mites were seen when the range of bee ages was ≤8 days, implying that the factors mediating the mites' adult-host preference change gradually with bee age. A possible chemical basis for host choice by *Varroa* is indicated by their greater propensity to move onto freezer-killed nurse bees than onto freezer-killed pollen foragers and by their lower movement onto heat-treated bees than onto control bees. Bee age, hive function, and directional changes in cuticular chemistry are all correlated. Movements of newly emerged mites in relation to these variables may provide insights into their reproductive success in *Apis mellifera* colonies. BC

References

Arechavaleta-Velasco, M.E. and E. Guzmán-Novoa 2001. *Relative effect of four characteristics that restrain the population growth of the mite* Varroa destructor *in honey bee* (Apis mellifera) *colonies*. Apidologie 32: 157-174.

Frey, E. and P. Rosenkranz 2014. *Autumn invasion rates of* Varroa destructor *(Mesostigmata: Varroidae) into honey bee (Hymenoptera: Apidae) colonies and the resulting increase in mite populations*. J. Econ. Entomol. 107: 508-515.

Fuchs, S. 1985. *Quantitative diagnosis of the infestation of bee hives by* Varroa jacobsoni *Oud. and distribution of the parasitic mite within the hives*. Apidologie 16: 343-368.

Gilley, D.C. and D.R. Tarpy 2005. *Three mechanisms of queen elimination in swarming honey bee colonies*. Apidologie 36: 461-474.

Kralj, J. and S. Fuchs 2006. *Parasitic* Varroa destructor *mites influence flight duration and homing ability of infested Apis mellifera* foragers. Apidologie 37: 577-587.

Kuenen, L.P.S. and N.W. Calderone 1997. *Transfers of* Varroa *mites from newly emerged bees: preferences for age- and function-specific adult bees (Hymenoptera: Apidae).* J. Insect Behav. 10: 213-228.

Martin, S.J. 2001. Varroa destructor *reproduction during the winter in* Apis mellifera *colonies in UK*. Exp. Appl. Acarol. 25: 321-325.

Mortensen, A.N., C.J. Jack and J.D. Ellis 2018. *The discovery of* Varroa destructor *on drone honey bees,* Apis mellifera, at drone congregation areas. Parasitol. Res. 117: 3337-3339.

Nolan, M.P. IV and K.S. Delaplane 2017. *Distance between honey bee* Apis mellifera *colonies regulates populations of* Varroa destructor *at a landscape scale*. Apidologie 48: 8-16.

Peck, D.T., M.L. Smith and T.D. Seeley 2016. Varroa destructor *mites can nimbly climb from flowers onto foraging honey bees*. PLoS ONE 11(12): e0167798 **doi:10.1371/journal/pone.0167798**

Rangel, J.S. and T.D. Seeley 2012. *Colony fissioning in honey bees: size and significance of the swarm fraction*. Insectes Soc. 29: 453-462.

Seeley, T.D. and M.L. Smith 2015. *Crowding honeybee colonies in apiaries can increase their vulnerability to the deadly ectoparasite* Varroa destructor. Apidologie 46: 716-727.

Wilde, J., S. Fuchs, J. Bratkowski and M. Siuda 2005. Distribution of *Varroa destructor* between swarms and colonies. J. Apic. Res. 44: 190-194.

Clarence Collison is an Emeritus Professor of Entomology and Department Head Emeritus of Entomology and Plant Pathology at Mississippi State University, Mississippi State, MS.

Introduction

In last month's Bee Culture article, "*Data Sharing Risks and Rewards for Hobbyist Beekeepers,*" we explored the risks and rewards of sharing data for hobbyist beekeepers who have a limited financial stake in keeping bees. This month we focus on the risks and rewards of data sharing for large sideliners and commercial beekeepers who do receive a significant portion of their income from their beekeeping operations (for simplicity, we will treat sideliners as part of the commercial group of beekeepers). The addition of financial incentives and the size and complexity of commercial operations adds another dimension to the risk/reward calculation, which we explore below.

First, we will provide a quick look at the current state of computing technology in commercial beekeeping operations and discuss reasons why commercial operations should be treated differently than hobbyist when it comes to data sharing, then we will review a few key points from the last article and discuss how these complications impact the risk reward calculation. Next month, we plan to follow up with trust-enhancing policy measures that could be used to address some of these risks and incentives and then explore how advances in technology and proper system architecture can also change the dynamics.

Commercial vs Hobbyist Beekeepers

The number of managed hives varies considerably for commercial beekeeping operations around the world, from a few hundred to tens of thousands. Regardless of the number of hives, the commercial beekeeper faces a variety of challenges to running a successful business that extends well beyond keeping bees healthy, though healthy bees certainly make the rest of the challenges easier to overcome and may provide a generous margin for error.

As the number of hives increases, the number of yard locations increases; the number of personnel required to manage those yards increases; and the amount of hive hardware, vehicles, support infrastructure, extraction equipment, sales and marketing staff, etc., also increases. This is typical of any industry as production scales and, similarly, as record keeping requirements scale for long term business success. One can assume commercial beekeeping operations keep records, but how much of it is digital or integrated across the operation?

Historically, the adoption and use of computing technology within the bee industry is fairly low and acceptance of new technologies is slow, lagging other sectors of agriculture where ag tech is having success. There are notable exceptions with multiple attempts by commercial operations to develop in-house solutions as well as external investors buying beekeeping operations with expectations of technology playing a role as it does in other business sectors. In addition, there is a noticeable generational shift occurring in many family-based businesses with the younger generation taking over operational decisions and consequently being more open to technology.

However, bringing technology into the commercial beekeeping landscape is difficult for a variety of reasons that are worth exploring in a future article. Even seemingly simple digital record keeping like yard locations, hive counts, and management actions present difficulties and can pose significant risks to the beekeeping operation. For example, yard locations are one of the most valuable assets for a commercial beekeeper and must be protected from both external and internal threats.

As noted already, as the scale of an operation increases, the internal need for good record keeping not only as it relates to hive tracking, but also as it relates to equipment, supplies, workers as well as products and customers, increases as well. What may be a "nice to have" at the hobbyist level becomes essential for a well run professional operation, and, as stated above, while still in the infancy stages, digital record keeping will be the key to running all aspects of an enterprise more efficiently in the future (see our May 2018 Bee Culture Article - *Electronic Records - A Path to Better Beekeeping*).

The scale of the operation affects not only the internal data requirements for running a business, but also increases the need to provide data externally to comply with hive registration requirements, complete government and non-profit surveys, document the fulfillment of pollination contracts, identify best practices, manage employees and more. See this article by Jamie Ellis for more information on beekeeping regulations[1].

Joseph Cazier, Ph.D is the Chief Analytics Officer for HiveTracks.com and Executive Director of the Center for Analytics Research and Education at Appalachian State University. You can reach him at ***joseph@hivetracks.com***

Walter Haefeker is a professional beekeeper from Upper Bavaria, board member of the German Professional Beekeepers Association, as well as President of the European Professional Beekeepers Association.

James Wilkes, Ph.D is the founder of HiveTracks.com, Computer Science Professor and Sideline Beekeeper.

Edgar Hassler, Ph.D is the Associate Director for Technology at the Center for Analytics Research and Education at Appalachian State University. You can reach him at ***hassleree@appstate.edu***

[1] **https://americanbeejournal.com/beekeeping-rules-regulations/**

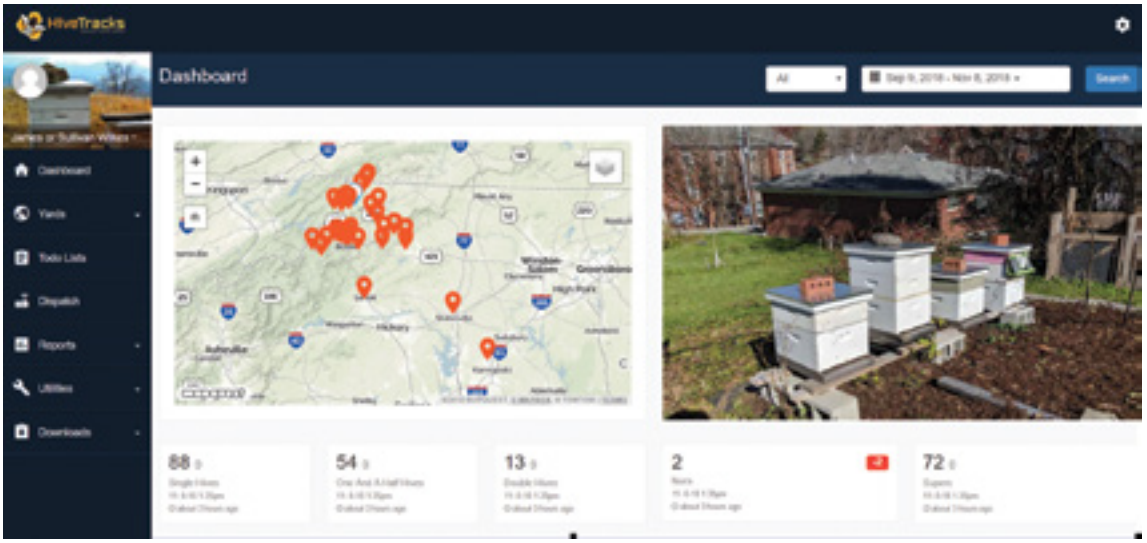


Figure 1. *A Hive Tracks Dashboard for Commercial Beekeepers.*

In addition to the regulatory and business concerns, the internal data of large commercial operations are much more interesting to competitors than those of a few hobbyists in the neighborhood (though recall this hobbyist data is still very important from the perspective of building a Genius Hive). For example, the digitization of a commercial beekeeping operation leads to the generation of large amounts of data, which inevitably will be of interest to a variety of third parties. The information contained in these data sets can have significant commercial consequences that would not be of concern to a small scale hobbyist.

This brings the concepts of competitive advantage, trade secrets, and business continuity to the forefront when thinking about commercial beekeeping data. This is also why the **HiveTracks.com** commercial software (See Figure 1) is very different from the **HiveTracks.com** hobbyist software – having a focus on workflow management and business continuity – with each operational instance having some customizable features and heightened privacy awareness and protections.

For commercial beekeepers, it is essential to stay in control of the data of their business and anybody designing solutions for managing and sharing those data needs to ensure that the information is well protected but can be shared in a carefully controlled manner when it is of mutual benefit to do so. If commercial beekeepers have no confidence in the data integrity of such systems, they will not use them and will miss out on the major benefits.

Poor confidence in data protection can also lead to the classic bad situation of "two sets of books" being kept. This is not ideal for the beekeepers, regulators, or others who need accurate data to make better decisions. In many cases, this situation can even lead to false or misleading data being provided by the beekeeper in order to protect his/her interests. Since having false or misleading data is generally worse that having no data at all, it is essential that any system built for commercial beekeepers be specifically tailored to them.

A cursory examination of a few *existing* honey bee data collection systems, both private sector/non-profit (Field Watch/BeeCheck) and government operated (North Dakota Department of Agriculture), which mostly revolve around yard locations, reveals that participating in these systems presents an inherent risk to the beekeeper because yard locations are now in the possession of a third party and, in some cases, are even exposed to public view, as in the North Dakota Bee Map in Figure 2 and the BeeCheck Map in Figure 3.

While the intentions of both of these systems are good for beekeepers, at the same time, it clearly elevates their risk with a public display of yard locations. This privacy exposure also opens up and magnifies the additional risk of hive theft and vandalism. This risk is not only to the beekeeper, but to the farmers who depend on them for pollination service. This situation is especially true since it is often precisely during the pollination season when hives might become most valuable to a thief looking to make some quick cash off of the stolen hives.

Another very recent example that bears close scrutiny due to the civil penalties/risk associated with *not* sharing information is the California program *Bee Where*[2] which gives agricultural commissioners' the authority to level fines to beekeepers who do not register and keep up-to-date records of their hive locations.

In light of the rest of this article, which quantifies the level of risk of sharing data and the examples where data is shared, the challenge becomes this: how do we navigate to a new ecosystem that has privacy protections in place? How do we record and share yard locations in a way that shares useful information but does not not hurt

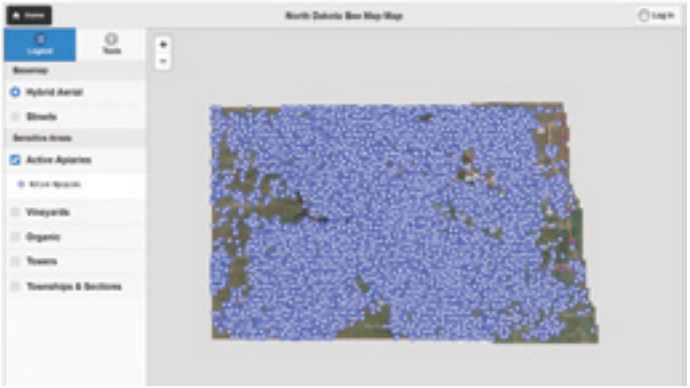


Figure 2. *Publicly accessible beeyard map for North Dakota. Each blue dot is a beeyard with beekeeper contact information available by hovering over dot.* ***https://beemap.ndda.nd.gov/map****.*

[2]**https://www.westernfarmpress.com/print/46367**

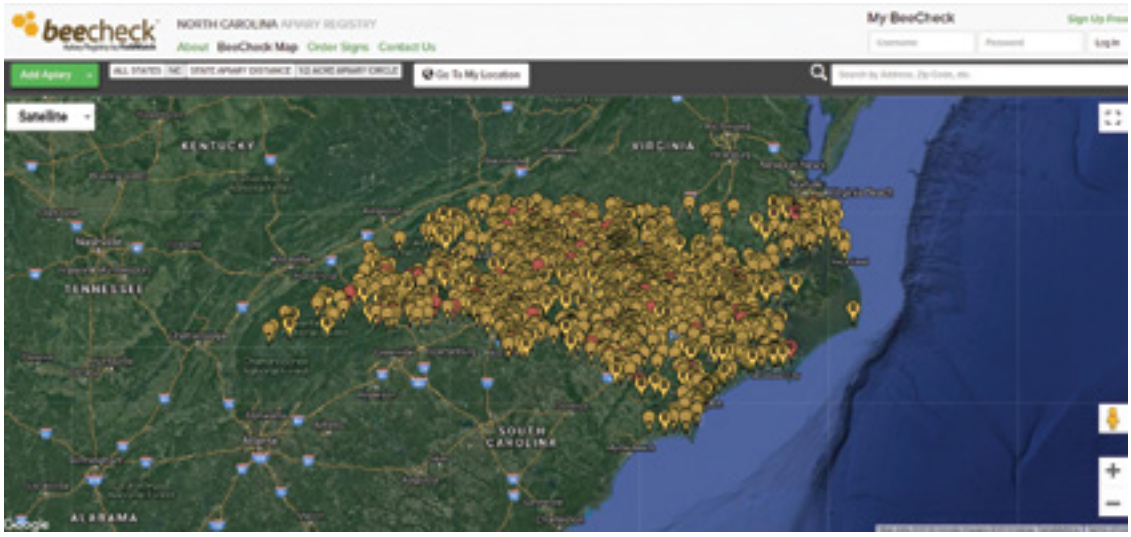


Figure 3.*Publicly accessible beeyard map for North Carolina. Each pin is a beeyard with beekeeper contact information available by clicking on pin* ***https://nc.beecheck.org/map***

the competitive advantage of the commercial beekeeper?

To complete this analysis, let's first complete our review of some of the key concepts of privacy risk from the last article, add a few more to address commercial beekeepers, and then analyze their impact on data sharing.

Review

We began last month's article with a discussion of *Risk Theory* which breaks the risk a beekeeper faces, including that of sharing information, into two important subcomponents. These are:

- ***Risk Likelihood (RL)****:* This is the probability or likelihood that someone's privacy will be violated.
- ***Risk Harm (RH)****:* This is the level of damage that could occur in the event of a privacy breach.

By looking at these components separately, it is easier to judge the seriousness of a given threat and make sound business decisions based on that risk. Beekeepers can judge the risk of something occurring and perhaps assign a probability score (such as 30% likelihood of contracting *Varroa* in this hive this year). They can then also assign a damage weighting on some useful scale (such as one to 10) to weight the severity of the risk (such as 10 for AFB). They then can multiply the two scores together (i.e. 30% probability of *Varroa* X 6 Severity) to get a score they can use to make management decisions by ranking all of the risks and deciding the appropriate courses of action to manage those risk in a thoughtful deliberate way.

In the next sections, we look at what some of these risks might be, and we will try to break them into these two components for analysis and discussion.

Information Sharing Risks

In the last article, we discussed several risks that a beekeeper could face due to information sharing. These were:

- ***Reputational Risk****:* A loss of reputation among friends, a small group, a private company, or a non-profit organization
- ***Compliance Risk****:* Risk of fines or punishment if doing something not permissible by the government (avoiding fees, taxes, registration or using off label treatment)
- ***Regulatory Risk****:* Risk of government interceding in the beekeeping operation in a way that the beekeeper would perceive as unwelcome, unnecessary, without cause, or for dubious reasons, or not interceding when needed.

Commercial beekeepers face these risks as well as a few more. These include:

- ***Loss of Competitive Advantage****:* Trade Secrets often help a business maintain an advantage over other similar businesses. This advantage is often referred to as a competitive advantage as it generally helps them earn higher profits. While trade secrets are not the only source of competitive advantage, it is nevertheless an important one.
- ***Legal Risk****:* As a larger scale actor, commercial beekeepers face larger scale risks than hobbyist beekeepers. If they fail to perform on a contract, deliver the agreed upon product, cause some real or perceived harm or have an employment dispute, they can face real legal risks. Having good data can either protect them by showing innocence or compliance, or hurt them if they are at fault.
- ***Financial Loss****:* Commercial beekeepers by definition depend on their bees for their livelihood. Thus any loss to their operation impacts them much greater than a hobbyist.
- ***Business Continuity***: Commercial beekeepers must have the right data to run their operation effectively. If the data does not measure the right things, is incomplete or inaccurate, beekeepers can suffer a loss in their business by making poor management decisions.

After a risk is identified, there is a strong tendency of assigning a low likelihood to it in order to avoid the effort of eliminating it completely. But, according to Murphy's Law, "Anything that can go wrong will go wrong." A larger scale operation will have a higher likelihood that something will go wrong because the dice get rolled a lot more often. A large dataset is also very attractive to other actors, who may not have the best interest of the beekeeper at heart. Therefore, it is very important to accurately assess and eliminate or manage any identified risk.

In the next section, we will explore each of these risks for commercial/sidliner beekeepers and extrapolate the

incentives they have to share (or not share) accurate (or misleading) information. Again, in the next article, we plan to focus on how good system design, new technologies, and better policies can help address these risks at the system level, reducing or eliminating them on the front end.

Risk Analysis

Keeping Records for Yourself

Much like hobbyist beekeepers, risks associated with internal record keeping may be relatively low when proper controls are in place. The determining factors are the breadth of dissemination within the organization and the ease with which unauthorized individuals may access the data. Another contributing factor may include whether the organization is attempting to conceal nefarious activities – a factor that would significantly increase both the likelihood and degree of harm the organization may suffer.

For our purposes in this article, we will assume proper controls are in place and the organization is devoid of nefarious activities.

- *Reputational Risk:* The Privacy Risk Harm and Risk Likelihood to this type of data keeping is relatively low. If controls fail, the likelihood and degree of harm become equivalent to sharing within a group comparable in size to the extent to which the data are shared. Even in the event that the likelihood of a risk was high, the harm would likely be low.
- *Compliance Risk:* Similar to hobbyists, the risk of sanctions are low for keeping your own records. It is possible that if there is a problem, the court may subpoena the records and use them as evidence in a case; it is also likely the records could be used to exonerate the organization, therefore it may be a wash. While the risk of a compliance event happening is very low in this scenario, the harm could be quite high.
- *Regulatory Risk:* The Privacy Risk Harm and Risk Likelihood to this type of data keeping is low with the primary risks being poor external or internal governance based on incomplete information. The likelihood of this risk is generally quite low, but it captures the imagination as the harm could be quite high.
- *Loss of Competitive Advantage:* The risk in this happening is moderate, but, paradoxically, it may be necessary to keep data in order to develop a competitive advantage. However, if it does happen, it would reduce real income, making it reasonably high in severity.
- *Legal Risk:* The Privacy Risk Harm and Risk Likelihood to this type of data keeping may actually come from not keeping data. Failure to report required information to authorities can lead to legal jeopardy and an inability to defend the organization. Good records may actually lower the severity of this risk while also reducing the likelihood.
- *Business Continuity:* The Privacy Risk Harm and Risk Likelihood to this type of data keeping is low. In fact, it can enhance decision making and profitability of the overall organization.
- *Financial Loss:* Financial loss related to this type of data keeping is low but may increase due to loss of reputation or competitive advantage. That said, anyone depending on beekeeping for their income would be very mindful of this risk, from whatever source.

Sharing Summary Information

If this data is shared anonymously, much of the risks are greatly reduced, which is why many surveys ask for data anonymously. However, the ability to check the reliability of the data also disappears. Additionally, much of the potential value is lost, such as the ability to find secondary causes of an event – weather, overspray, genetic susceptibility etc. It also minimizes the ability to aggregate a controlled sample enough to build a real predictive model useful for decision support. Therefore, for this analysis, we will assume that the information is accurate and identifiable.

- ***Reputational Risk****:* There are both reputational risks and rewards for sharing summary information with an organization, depending on how the operation performed and how much the beekeeper cares what others think.
- ***Compliance Risk****:* There is a medium level of risk that if beekeepers are not doing something they are supposed to be doing they could be caught with summary data. This risk is reduced by being diligent in complying with any relevant rules and regulations.
- ***Regulatory Risk****:* Sharing good summary information may help or hurt with regulation. On the one hand, regulators may see good summary information and assume your operation is complying and leave you alone; alternatively, they could see a problem and come to help in a way you are not excited about.
- ***Loss of Competitive Advantage****:* A competitor may notice how well you are doing and study your operation for ways to better compete and potentially copy your competitive advantage. However, you might also get ideas from others and all do better.
- ***Legal Risk****:* Summary information shared with a contract partner, such as for pollination services, may be required by a contract. Good data can help mitigate risks, especially later as crops grow and there is good documentation of services provided. However, if they do not match observations, there could be some trouble.
- ***Business Continuity***: This is the risk that includes, but is not limited to, some of the other risks. If any of the other impacts are large enough they could force a beekeeper out of business. Note that this could include poor management decisions stemming from not keeping good records.
- ***Financial Loss****:* Depending on the regulatory environment, not sharing accurate data could lead to fines or other financial losses, as noted in the case of the *Bee Where* program in California, discussed above.

Sharing Detailed Data

The risks of sharing detailed data largely depend on who you are sharing them with, and is much more risky for commercial operators whose livelihood is at risk. As the risk profile is similar to that of summary data, but more intense, we will defer a point-by-point analysis. However, note that generally the more detailed the data, the greater the risk, but also, in the age of data science, the greater the potential benefit.

Most commercial operations would not share detailed data with anyone, including a government, without real protections. Yet with the tools that data science has to offer, such detailed information can be used to help and guide these operations in ways that were not available before. Summary data is not sufficient for this type of analysis and support. But there are ways to protect the identity of the user and still get the detail needed for beneficial analysis and application.

It is specifically for the reasons mentioned above that commercial beekeepers need their own software system, with system-designed controls to mitigate privacy risk harm and likelihood. This action should be done in a way that can still benefit operations and those of other beekeepers in a risk-mitigated way, so all can capture the shared benefit while preserving bees and our food supply.

Conclusion

The key is in aligning the incentives. In general, beekeepers love bees and want them to do well, they are too important not to protect. The key is in aligning the incentives correctly to protect what needs to be protected while learning what needs to be learned to help beekeeping operations thrive. By building a system and adjusting policies in a way that manages these risks correctly, we can together build a system that works for everyone. This will be the subject of our next article.

Finally, special thanks to *Project Apis m.* for supporting a portion of this work with a *Healthy Hives 2020* grant, to leaders at **HiveTracks.com** for sharing their thoughts on this topic and to the editors of *Bee Culture* for publishing this work. These efforts would not have been possible without visionary groups like this one providing support and resources. BC

Record Keepin

Malcolm **Sanford**

Many beekeepers have a tough time recording all that goes on in an apiary as well as individual beehives. Lack of suitable record keeping that can be accessed in an organized way works against effective management in any setting, but is especially important for the beekeeper. In this technological age, the amount of data that is possible to collect is mind boggling. Thus, more than ever beekeepers risk being swamped by almost infinite possibilities when it comes to making management decisions.

At a recent workshop, Dr. Frank Linton, informally referred to as the "beepeeker," **http://thebeepeeker.com/** and author of a book on one of the traditionally most-used record keeping devices, the observation beehive (The Observation Hive Handbook **www.amazon.com/Observation-Hive-Handbook-Studying-Honey/dp/1501707264/ref=pd_lpo_sbs_14_img_0?_encoding=UTF8&psc=1&refRID=Q90PNVHNA6PVMB3D9YSF**, stated:

"The current high rate of colony loss, 30%-40% annually, presents beekeepers with a conundrum. More-frequent inspections might reduce these losses by revealing small problems before they become big ones, but every inspection disturbs the bees and unnecessary inspections may themselves contribute to colony losses.

"For many beekeepers, then the issue is not too many inspections but too few. Current monitoring activities usually employ things that beekeepers have always used to a varying degree to record relevant observations, including sticks and stones to indicate the results of inspections inside a colony (some may even write down their reflections in a notebook!) or relying on one's experience by simply looking at outside conditions (weather), those inside a colony, and/or closely examining entrance behavior for evidence of 'abnormality.' "

Collectively, then, data collection by individual beekeepers over time, along with decisions made based on experience becomes essential for effective honey bee management. The specific methods employed by those successful in the endeavor, however, are often not easily communicated nor understood, resulting in what many might call, the "art" of beekeeping.

Fortunately, a number applications of are now available for smartphones in this digital age, specifically designed to help beekeepers keep better track of observational data on colonies and beeyards, and also provide valuable information on a myriad of other topics affiliated with the beekeeping craft. According to Wikipedia, "Smartphones are a class of **mobile phones** and of multi-purpose **mobile computing** devices. They are distinguished from **feature phones** by their stronger hardware capabilities and extensive **mobile operating systems**, which facilitate wider **software**, **internet** (including **web browsing** over **mobile broadband**), and **multimedia** functionality (including music, video, **cameras**, and **gaming**), alongside core phone functions such as **voice calls** and **text messaging**." **https://en.wikipedia.org/wiki/Smartphone**.

The following list contains several smartphone programs (applications or "Apps.") that are involved in cataloging and manipulating specific information related to managing honey bee colonies. Others are employed to help understand the biology of the honey bee, diseases and possible pests in the apiary, effects of pesticides on honey bees, and cataloging colony losses both in quantity and from a geographic perspective. Finally, one helps catalog and care for plants that are important to native insects, as well as honey bees.

The specific smartphone Apps listed here cannot be considered a comprehensive list. Rather, those selected provide readers a range of potential information collection and associated data manipulation that are now available. Given the pace of technological change, more Apps are sure to be on the horizon, no doubt being developed as this article goes to press.

Apiary Book allows recording on a mobile phone the information on the number, health and maintenance of each bee family, treatments carried out, and other operations in the field of beekeeping. Using a friendly interface, a beekeeper can define several apiaries (hearths), can add work to be performed, harvests (honey, wax), colony movements, veterinary controls and others! **http://www.apiarybook.com/#download**

Hive Tracks is perhaps the most well-known and publicized program. It is cloud-based software and features data analytics products focused on honey bee health, beekeeping optimization, and the honey bee's direct connection to global food production. **https://hivetracks.com/about_us.php**

Hive Keepers records apiaries with google maps integration. Inspect at four levels, apiary, hive, super, frame. **https://hivekeepers.com/** App is on the website.

Beenotes is the first and only voice-controlled apiculture application. One simply speaks and the application easily and reliably records all the necessary data that will enable you to comfortably manage, organize and increase the performance of your apiary. **http://www.beenotes.com/**

The BeeAlert application from Brazil is the first online platform for cataloging the disappearance of registration or death of bees by geolocation. With the application, beekeepers and the scientific community can record and document the occurrences worldwide, indicating locality, intensity and possible causes of honey bee loss (pesticides, diseases, pests, etc). This collaboratively generated information represents a major contribution to the protection of honey bees. The data are confidential

ng With Smart Phone Apps

and will be used for scientific purposes. **http://www.semabelhasemalimento.com.br/?lang=en**

Bee Plus stores apiary and hive information in one place. It easily logs detailed inspection data and honey production on the move. Data and photos can be synchronized for backup or sharing. This is a Facebook application it seems, which might be out of date. Last post December 2017. **https://www.facebook.com/beeplusapp/**

Bee Tight replaces the paper or spreadsheet-based records that most beekeepers seem to use, so its first job is to handle records of inspections. It records laying pattern and temperament on a six-point scale. **https://www.beetight.com/pages/about**

The B App is created by commercial beekeepers, and with the input of beekeepers around the world. It has wide range of uses for managing honey bee colonies. **https://www.thebapp.com/**

Find Hive is a GPS Beehive tracking device for locating and recovering beehives. **https://findmyhive.com/**

The next two applications deal with pesticide poisoning. The Bee Safe Oregon State University application is rooted in the publication How to Reduce Bee Poisoning first produced in 2006. It was expanded in 2013 by coauthor Louisa Hooven, a toxicologist and bee expert in the College of Agricultural Sciences, with an extensive update. Products are sorted into three classes: highly toxic, toxic and "no bee precautionary statement on label." The ratings are based on the cautions and restrictions required by the Environmental Protection Agency and listed on the product labels. **https://catalog.extension.oregonstate.edu/pnw591**

Bee Connect is a Canadian application that enables two-way communication on the location of hives and crop protection between registered farmers and contractors. Contractors and farmers are able to input information on their crop protection activities that may be of interest to a beekeeper, and operators are able to notify nearby farmers of the location of their hives. This opens up a line of communication through an internal messaging system. **http://www.beeconnected.ca/**

An Alberta Canada Beehealth application is based on current scientific knowledge of honey bee diseases and pests. It is a handy resource to help beekeepers and other users to detect, diagnose, manage and treat honey bee diseases and pests. It includes pictures and treatment options which will aid beekeepers in adopting appropriate pest management practices. Thus, beekeepers can improve bee health and enhance on-farm food safety and biosecurity practices in their operations. **http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/prm13239**

HiveScience is a citizen science project for beekeepers to submit hive health reports, *Varroa* mite counts, and request kits to send honey samples to Environmental Protection Agency (EPA). This data may allow tracking hive health through analysis of honey samples and also record *Varroa* mite infestations across regions in real-time. It will also provide information about the real-world effectiveness of registered miticides. **https://www.epa.gov/citizen-science/hivescience**

OsBeehives is on a mission to build a global network of beekeepers who will be able to identify causes and solutions for colony health deterioration. This mission is founded on the principles of citizen science, open data, and collaboration between beekeepers. **https://www.osbeehives.com/pages/about-us**

The Bee Smart Pollinator Gardener has an easy user interface that browses through a database of nearly 1,000 native plants. Plants can be filtered by pollinators attraction, light and soil requirements, bloom color, and plant type. This is an excellent plant reference to attract bees, butterflies, hummingbirds, beetles, bats, and other pollinators to the garden, farm, school and every landscape. **https://pollinator.org/bee-smart-app**

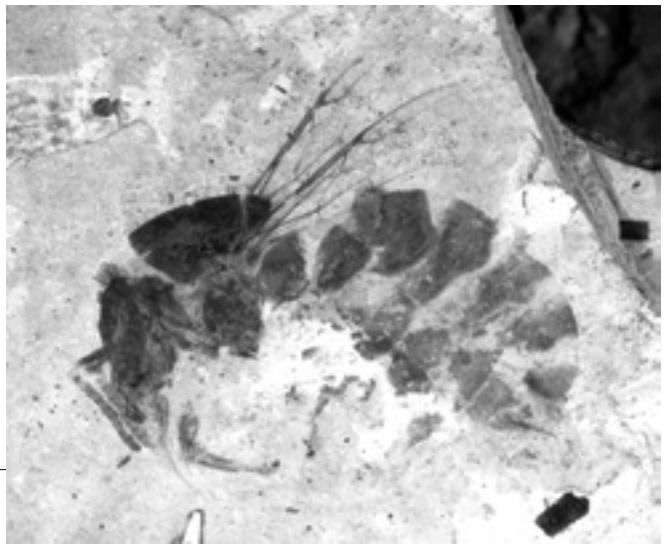
Dr. Linton concluded at the workshop that there are big potential rewards in precisely monitoring honey bee activity and more fully understanding apiculturally-related activities of the modern beekeeping scene. The smartphone Apps listed here are optimistic signs that this is currently happening in real time. Beekeepers should continue to be on the outlook for more of the same as the technological revolution matures. BC

Darwinian Beekeeping

An evolutionary approach to apiculture

Tom **Seeley**

Evolution by natural selection is a foundational concept for understanding the biology of honey bees, but it has rarely been used to provide insights into the craft of beekeeping. This is unfortunate because solutions to the problems of beekeeping and bee health may come most rapidly if we are as attuned to the biologist Charles R. Darwin as we are to the Reverend Lorenzo L. Langstroth.



Photograph of a 30-million-year-old fossil of a worker honey bee in the species Apis henshawi. *This worker is 0.55 inches long, so its size is close to that of an* Apis mellifera *worker bee.*

Adopting an evolutionary perspective on beekeeping may lead to better understanding about the maladies of our bees, and ultimately improve our beekeeping and the pleasure we get from our bees. An important first step toward developing a Darwinian perspective on beekeeping is to recognise that honey bees have a stunningly long evolutionary history, evident from the fossil record. One of the most beautiful of all insect fossils is that of a worker honey bee, the species *Apis henshawi*, discovered in 30-million-year-old shales from Germany (Fig. 1). There also exist superb fossils of our modern honey bee species, *Apis mellifera*, in amber-like materials collected in East Africa that are about 1.6 million years old (Engel 1998).

We know, therefore, that honey bee colonies have experienced millions of years of being shaped by the relentless operation of natural selection. Natural selection maximizes the abilities of living systems (such as honey bee colonies) to pass on their genes to future generations. Colonies differ in their genes, therefore colonies differ in all the traits that have a genetic basis, including colony defensiveness, vigour in foraging, and resistance to diseases. The colonies best endowed with genes favouring colony survival and reproduction in their locale have the highest success in passing their genes on to subsequent generations, so over time the colonies in a region become well adapted to their environment.

This process of adaptation by natural selection produced the differences in worker bee colour, morphology, and behaviour that distinguish the 27 subspecies of *Apis mellifera* (e.g., *A.m. mellifera*, *A. m. ligustica*, and *A. m. scutellata*) that live within the species' original range of Europe, western Asia, and Africa (Ruttner 1988). The colonies in each subspecies are precisely adapted to the climate, seasons, flora, predators, and diseases in their region of the world.

Moreover, within the geographical range of each subspecies, natural selection produced ecotypes, which are fine-tuned, locally adapted populations. For example, one ecotype of the subspecies *Apis mellifera mellifera* evolved in the Landes region of southwest France, with its biology tightly linked to the massive bloom of heather (*Calluna vulgaris* L.) in August and September. Colonies native to this region have a second strong peak of brood rearing in August that helps them exploit this heather bloom. Experiments have shown that the curious annual brood cycle of colonies in the Landes region is an adaptive, genetically based trait (Louveaux 1973, Strange et al. 2007).

Modern humans (Homo sapiens) are a recent evolutionary innovation compared with honey bees. We arose some 150,000 years ago in the African savannahs, where honey bees had already been living for aeons. The earliest humans were hunter gatherers who hunted honey bees for their honey, the most delicious of all natural foods. We certainly see an appetite for honey in one hunter-gatherer population still in existence, the Hadza people of northern Tanzania. Hadza men spend four to five hours per day in bee hunting, and honey is their favourite food (Marlowe et al. 2014).

Bee hunting began to be superseded by beekeeping some 10,000 years ago, when people in several cultures started farming and began domesticating plants and animals. Two regions where this transformation in human history occurred are the alluvial plains of Mesopotamia and the Nile Delta. In both places, ancient hive beekeeping has been documented by archaeologists. Both are within the original distribution of *Apis mellifera*, and both have open habitats where swarms seeking a nest site probably had difficulty finding natural cavities and occupied the clay pots and grass baskets of the early farmers (Crane 1999).

In Egypt's sun temple of King Ne-user-re at Abu Ghorab, there is a stone bas-relief ca. 4400 years old that shows a beekeeper kneeling by a stack of nine cylindrical clay hives (Fig. 2). This is the earliest indication of hive beekeeping and it marks the start of our search for an optimal system of beekeeping. It also marks the start

of managed colonies living in circumstances that differ markedly from the environment in which they evolved and to which they were adapted. Notice, for example, how the colonies in the hives depicted in the Egyptian bas-relief lived crowded together rather than spaced widely across the land.

Wild colonies versus managed colonies

Today there are considerable differences between the environment of evolutionary adaptation that shaped the biology of wild honey bee colonies and the current circumstances of managed honey bee colonies. Wild and managed live under different conditions because we beekeepers, like all farmers, modify the environments in which our livestock live to boost their productivity. Unfortunately, these changes in the living conditions of agricultural animals often make them more prone to pests and pathogens. In Table 1, I list 20 ways in which the living conditions of honey bees differ between wild and managed colonies, and I am sure you can think of more.

Difference 1: Colonies **are** versus **are not** genetically adapted to their locations. Each of the subspecies of *Apis mellifera* was adapted to the climate and flora of its geographic range and each ecotype within a subspecies was adapted to a particular environment. Shipping mated queens and moving colonies long distances for migratory beekeeping forces colonies to live where they may be poorly suited. A recent, large-scale experiment conducted in Europe found that colonies with queens of local origin lived longer than colonies with queens of non-local origin (Büchler et al. 2014).

Difference 2: Colonies live **widely spaced across the landscape** versus **crowded in apiaries**. This difference makes beekeeping practical, but it also creates a fundamental change in the ecology of honey bees. Crowded colonies experience greater competition for forage, greater risk of being robbed, and greater problems reproducing (e.g., swarms combining and queens entering wrong hives after mating). Probably the most harmful consequence of crowding colonies, though, is boosting pathogen and parasite transmission between colonies (Seeley & Smith 2015). This facilitation of disease transmission boosts the incidence of disease and it keeps alive the virulent strains of the bees' disease agents.

Difference 3: Colonies live in **relatively small nest cavities** versus **in large hives**. This difference also profoundly changes the ecology of honey bees. Colonies in large hives have the space to store huge honey crops but they also swarm less because they are not as space limited, which weakens natural selection for strong, healthy colonies since fewer colonies reproduce. Colonies kept in large hives also suffer greater problems with brood parasites such as *Varroa* (Loftus et al. 2016).

Difference 4: Colonies live **with** versus **without** a nest envelope of antimicrobial plant resin. Living without a propolis envelope increases the cost of colony defense against pathogens. For example, workers in colonies without a propolis envelope invest more in costly immune system activity (i.e., synthesis of antimicrobial peptides) relative to workers in colonies with a propolis envelope (Borba et al. 2015).

Difference 5: Colonies have **thick** versus **thin** nest cavity walls. This creates a difference in the energetic cost of colony thermoregulation, especially in cold climates. The rate of heat loss for a wild colony living in a typical tree cavity is four to seven times lower than for a managed colony living in a standard wooden hive (Mitchell 2016).

Difference 6: Colonies live with **high and small** versus **low and large** entrances. This difference renders managed colonies more vulnerable to robbing and predation (large entrances are harder to guard), and it may lower their winter survival (low entrances get blocked by snow, preventing cleansing flights).

Difference 7: Colonies live **with** versus **without** plentiful drone comb. Inhibiting colonies from rearing drones boosts their honey production (Seeley 2002) and slows reproduction by *Varroa* (Martin 1998), but it also hampers natural selection for colony health by preventing the healthiest colonies from passing on their genes (via drones) the most successfully.

Difference 8: Colonies live **with** versus **without a stable nest organisation**. Disruptions of nest organisation for beekeeping may hinder colony functioning. In nature, honey bee colonies organise their nests with a precise 3-D organisation: compact broodnest surrounded by pollen stores and honey stored above (Montovan et al. 2013). Beekeeping practices that modify the nest organisation, such as inserting empty combs to reduce congestion in the broodnest, hamper thermoregulation and may disrupt other aspects of colony functioning such as egg laying by the queen and pollen storage by foragers.

Difference 9: Colonies experience **infrequent** versus **sometimes frequent** relocations. Whenever a colony is moved to a new location, as in migratory beekeeping, the foragers must relearn the landmarks around their hive and must discover new sources of nectar, pollen, and water. One study found that colonies moved overnight to a new location had smaller weight gains in the week following the move relative to control colonies already living in the location (Moeller 1975).

Difference 10: Colonies are **rarely** versus **frequently** disturbed. We do not know how frequently wild colonies experience disturbances (e.g., bear attacks), but it is probably rarer than for managed colonies whose nests are easily cracked open, smoked, and manipulated. In one experiment, Taber (1963) compared the weight gains of colonies that were and were not inspected during a honey flow, and found that colonies that were inspected gained 20-30% less weight (depending on extent of disturbance) than control colonies on the day of the inspections.

Difference 11: Colonies **do not** versus **do** deal with novel diseases. Historically, honey bee colonies dealt only with the parasites and pathogens with whom they had long been in an arms race. Therefore, they had evolved means of surviving with their agents of disease. We humans changed all this when we triggered the global spread of the ectoparasitic mite *Varroa* destructor from eastern Asia, small hive beetle (*Aethina tumida*) from sub-Saharan Africa, and chalkbrood fungus (*Ascosphaera apis*) and acarine mite (*Acarapis woodi*) from Europe. The spread of *Varroa* alone has resulted in the deaths of millions of honey bee colonies (Martin 2012).

Difference 12: Colonies have **diverse** versus **homogeneous** food sources. Some managed colonies are placed in agricultural ecosystems (e.g., huge almond orchards or vast fields of oilseed rape) where they experience low diversity pollen diets and poorer nutrition. The effects of pollen diversity were studied by comparing nurse bees

PACKAGE BEES

HEALTHY ⬢ PRODUCTIVE ⬢ STRONG ⬢ QUALITY

Look no further than Mann Lake for quality bee packages and queens to start the season off right. Our bee supplier consistently produces strong and healthy bees year after year to ensure you're getting productive packages with gentle queens.

Packages & individual queens will be available for pick-up at our fully stocked locations in:

HACKENSACK, MN WILKES-BARRE, PA

QUANTITIES LIMITED. PRE-ORDER NOW!
CONTACT US FOR MORE INFORMATION

MANN LAKE
WE KNOW BEES

800-880-7694
www.mannlakeltd.com

given diets with monofloral pollens or polyfloral pollens. Bees fed the polyfloral pollen lived longer than those fed the monofloral pollens (Di Pasquale et al. 2013).

Difference 13: Colonies have **natural diets** versus **sometimes being fed artificial diets**. Some beekeepers feed their colonies protein supplements ("pollen substitutes") to stimulate colony growth before pollen is available, to fulfil pollination contracts and produce larger honey crops. The best pollen supplements/substitutes do stimulate brood rearing, though not as well as real pollen (**http://scientificbeekeeping.com/a-comparative-test-of-the-pollen-sub/**) and may result in workers of poorer quality (Scofield and Mattila 2015).

Difference 14: Colonies **are not** versus **are exposed** to novel toxins. The most important new toxins of honey bees are insecticides and fungicides, substances for which the bees have not had time to evolve detoxification mechanisms. Honey bees are now exposed to an ever increasing list of pesticides and fungicides that can synergise to cause harm to bees (Mullin et al. 2010).

Difference 15: Colonies **are not** versus **are treated** for diseases. When we treat our colonies for diseases, we interfere with the host-parasite arms race between Apis mellifera and its pathogens and parasites. Specifically, we weaken natural selection for disease resistance. It is no surprise that most managed colonies in North America and Europe possess little resistance to *Varroa* mites, or that there are populations of wild colonies on both continents that have evolved strong resistance to these mites (Locke 2016). Treating colonies with acaracides and antibiotics may also interfere with the microbiomes of a colony's bees (Engel et al. 2016).

Difference 16: Colonies **are not** versus **are** managed as sources of pollen and honey. Colonies managed for honey production are housed in large hives, so they are more productive. However, they are also less apt to reproduce (swarm) so there is less scope for natural selection for healthy colonies. Also, the vast quantity of brood in large-hive colonies renders them vulnerable to population explosions of *Varroa* mites and other disease agents that reproduce in brood (Loftus et al. 2016).

Difference 17: Colonies **do not** versus **do** suffer losses of beeswax. Removing beeswax from a colony imposes a serious energetic burden. The weight-to-weight efficiency of beeswax synthesis from sugar is at best about 0.10 (data of Weiss 1965, analyzed in Hepburn 1986), so every pound of wax taken from a colony costs it some 10 pounds of honey that is not available for other purposes, such as winter survival. The most energetically burdensome way of harvesting honey is removal of entire combs filled with honey (e.g., cut comb honey and crushed comb honey). It is less burdensome to produce extracted honey since this removes just the cappings wax.

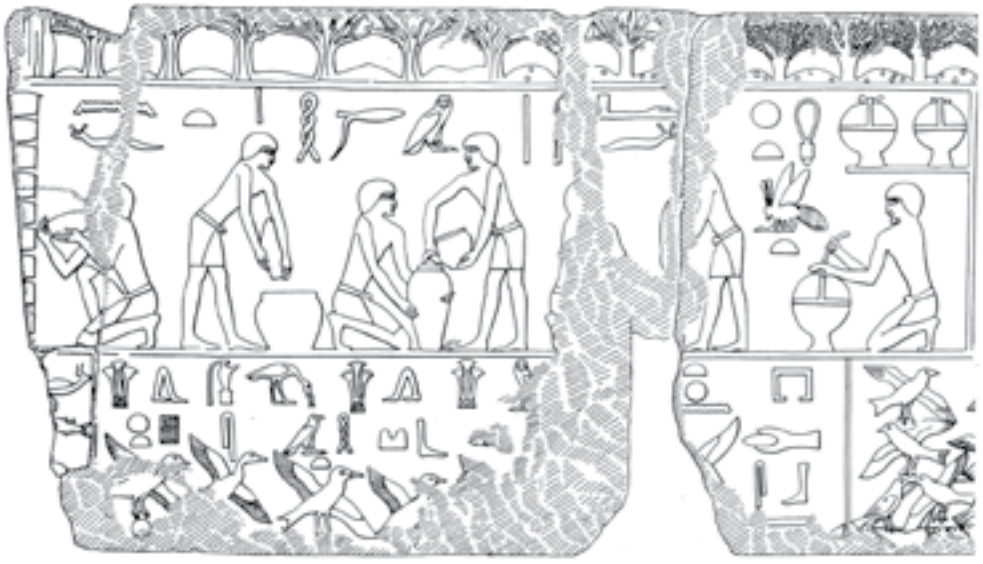
Difference 18: Colonies **are** versus **are not choosing the larvae used for rearing queens**. When we graft day-old larvae into artificial queen cups during queen rearing, we prevent the bees from choosing which larvae will develop into queens. One study found that in emergency queen rearing the bees do not choose larvae at random and instead favour those of certain patrilines (Moritz et al. 2005).

Difference 19: Drones **are** versus **are not allowed to compete fiercely for mating**. In bee breeding programs that use artificial insemination, the drones that provide sperm do not have to prove their vigour by competing amongst other drones for mating. This weakens the sexual selection for drones that possess genes for health and strength.

Difference 20: Drone brood **is not** versus **is** removed from colonies for mite control. The practice of removing drone brood from colonies to control *Varroa* destructor partially castrates colonies and so interferes with natural selection for colonies that are healthy enough to invest heavily in drone production.

Suggestions for Darwinian beekeeping

Beekeeping looks different from an evolutionary perspective. We see that colonies of honey bees lived independently from humans for millions of years, and during this time they were shaped by natural selection to be skilled at surviving and reproducing wherever they lived, in Europe, western Asia, or Africa. We also see that ever since humans started keeping bees in hives, we have been disrupting the exquisite fit that once existed between honey bee colonies and their environments. We have done this in two ways: 1) by moving colonies to geographical locations to which they are not well adapted, and 2) by managing colonies in ways that interfere with their lives



Earliest known depiction of beekeeping and honey preparation, from the sun temple of King Ne-user-re, at Abu Ghorab, Egypt, built around 2400 BCE. Harvesting honey from a tall stack of cylindrical hives on the left, handling honey in the middle and packing honey on the right. Drawing based on Figure 20.3a in Crane (1999).

but that provide us with honey, beeswax, propolis, pollen, royal jelly, and pollination services.

What can we do, as beekeepers, to help honey bee colonies live with a better fit to their environment, and thereby live with less stress and better health? The answer to this question depends greatly on how many colonies you manage, and what you want from your bees. A beekeeper who has a few colonies and low expectations for honey crops, for example, is in a vastly different situation from a beekeeper who has thousands of colonies and is earning a living through beekeeping.

For those interested, I offer 10 suggestions for bee-friendly beekeeping. Some have general application while others are feasible only for the backyard beekeeper.

1. **Work with bees that are adapted to your location**. If you live in a location where there are few beekeepers, use bait hives to capture swarms from the wild colonies living in your area. (Incidentally, these swarms will build you beautiful new combs, and this will enable you to retire old combs that could have heavy loads of pesticide residues and pathogen spores/cells.) The key thing is to acquire queens of a stock that is adapted to your climate.
2. **Space your hives as widely as possible**. Where I live, in central New York State, there are vast forests filled with wild honey bee colonies spaced roughly a half mile apart. This is perhaps ideal for wild colonies but problematic for the beekeeper. Still, spacing colonies just 30-50 yards apart in an apiary greatly reduces drifting and thus the spread of disease.
3. **House your bees in small hives**. Consider using just one deep hive body for a broodnest and one medium-depth super over a queen excluder for honey. You will not harvest as much honey, but you will likely have reduced disease and pest problems, particularly *Varroa*. And yes, your colonies will swarm, but swarming is natural and research shows that it promotes colony health by helping keep *Varroa* mite populations at safe levels (see Loftus et al 2016).
4. **Roughen the inner walls of your hives, or build them of rough-sawn lumber**. This will stimulate your colonies to coat the interior surfaces of their hives with propolis, thereby creating antimicrobial envelopes around their nests.
5. **Use hives whose walls provide good insulation**. These might be hives built of thick lumber, or they might be hives made of plastic foam. We urgently need research on how much insulation is best for colonies in different climates, and how it is best provided.
6. **Position hives high off the ground**. This is not always do-able, but if you have a porch or deck where you can position some hives, then perhaps it is feasible. We urgently need research on how much entrance height is best in different climates.
7. **Let 10-20% of the comb in your hives be drone comb**. Givng your colonies the opportunity to rear drones can help improve the genetics in your area. Drones are costly, so it is only the strongest and healthiest colonies that can afford to produce legions of drones. Unfortunately, drone brood also fosters rapid growth of a colony's population of *Varroa* mites, so providing plentiful drone comb requires careful monitoring of the Varroa levels in your hives (see suggestion 10, below).
8. **Minimize disturbances of nest organisation**. When working a colony, replace each frame in its original position and orientation. Also, avoid inserting empty frames in the broodnest to inhibit swarming.
9. **Minimize relocations of hives**. Move colonies as rarely as possible. If you must do so, then do so when there is little forage available.
10. **Refrain from treating colonies for *Varroa***.

WARNING: This last suggestion should only be adopted if you can do so carefully, as part of a program of extremely diligent beekeeping. If you pursue treatment-free beekeeping without close attention to your colonies, then you will create a situation in your apiary in which natural selection is favouring virulent *Varroa* mites, not *Varroa*-resistant bees. To help natural selection favour

Table 1. Comparison of the environments in which honey bee colonies lived (and sometimes still do) as wild colonies and those in which they live currently as managed colonies.

	Environment of evolutionary adaptedness	**Current circumstances**
1.	Colonies genetically adapted to location	Colonies not genetically adapted to location
2.	Colonies live widely spaced in landscape	Colonies live crowded in apiaries
3.	Colonies occupy small (ca 1.5 cu ft) cavities	Colonies occupy large (ca. 3+ cu ft) hives
4.	Nest cavity walls have a propolis coating	Hive walls have no propolis coating
5.	Nest cavity walls are thick (ca. 4+ in, 10+ cm)	Hive walls are thin (ca. $^3/_4$ in, 19 mm)
6.	Nest entrance is high & small (ca. 4 sq in, 26 cm^2)	Nest entrance is low & large (ca. 12 sq in, 77 cm^2)
7.	Nest has 10-25% drone comb	Nest has little (< 5%) drone comb
8.	Nest organisation is stable	Nest organisation is often altered
9.	Nest-site relocations are rare	Hive relocations can be frequent
10.	Colonies are rarely disturbed	Colonies are frequently disturbed
11.	Colonies deal with familiar diseases	Colonies deal with novel diseases
12.	Colonies have diverse pollen sources	Colonies have homogeneous pollen sources
13.	Colonies have natural diets	Colonies sometimes have artificial diets
14.	Colonies are not exposed to novel toxins	Colonies exposed to insecticides and fungicides
15.	Colonies are not treated for diseases	Colonies are treated for diseases
16.	Pollen not trapped, honey not taken	Pollen sometimes trapped, honey often taken
17.	Beeswax is not removed	Beeswax is removed during honey harvests
18.	Bees choose larvae for queen rearing	Beekeepers choose larvae for queen rearing
19.	Drones compete fiercely for mating	Queen breeder may select drones for mating
20.	Drone brood not removed for mite control	Drone brood sometimes removed and frozen

Varroa-resistant bees, you will need to monitor closely the mite levels in all your colonies and kill those whose mite populations are skyrocketing long before these colonies can collapse. By preemptively killing your *Varroa*-susceptible colonies, you will accomplish two important things: 1) you will eliminate your colonies that lack Varroa resistance and 2) you will prevent the "mite bomb" phenomenon of mites spreading en masse to your other colonies. If you don't perform these preemptive killings, then even your most resistant colonies could become overrun with mites and die, which means that there will be no natural selection for mite resistance in your apiary. Failure to perform preemptive killings can also spread virulent mites to your neighbours' colonies and even to the wild colonies in your area that are slowly evolving resistance on their own. If you are not willing to kill your mite-susceptible colonies, then you will need to treat them and requeen them with a queen of mite-resistant stock.

Two hopes

I hope you have found it useful to think about beekeeping from an evolutionary perspective. If you are interested in pursuing beekeeping in a way that is centred less on treating a bee colony as a honey factory, and more on nurturing the lives of honey bees, then I encourage you to consider what I call Darwinian Beekeeping. Others call it Natural Beekeeping, Apicentric Beekeeping, and Bee-friendly Beekeeping (Phipps 2016). Whatever the name, its practitioners view a honey bee colony as a complex bundle of adaptations shaped by natural selection to maximize a colony's survival and reproduction in competition with other colonies and other organisms (predators, parasites, and pathogens). It seeks to foster colony health by letting the bees live as naturally as possible, so they can make full use of the toolkit of adaptations that they have acquired over the last 30 million years. Much remains to be learned about this toolkit – how exactly do colonies benefit from better nest insulation? Do colonies tightly seal their nests with propolis in autumn to have an in-hive water supply (condensate) over winter? How exactly do colonies benefit from having a high nest entrance? The methods of Darwinian Beekeeping are still being developed, but fortunately, apicultural research is starting to embrace a Darwinian perspective (Neumann and Blacquiere 2016).

I hope too that you will consider giving Darwinian Beekeeping a try, for you might find it more enjoyable than conventional beekeeping, especially if you are a small-scale beekeeper.

Everything is done with bee-friendly intentions and in ways that harmonize with the natural history of *Apis mellifera*. As someone who has devoted his scientific career to investigating the marvellous inner workings of honey bee colonies, it saddens me to see how profoundly – and ever increasingly – conventional beekeeping disrupts and endangers the lives of colonies. Darwinian Beekeeping, which integrates respecting the bees and using them for practical purposes, seems to me like a good way to be responsible keepers of these small creatures, our greatest friends among the insects. BC

ACKNOWLEDGEMENTS

I thank Mark Winston and David Peck for many valuable suggestions that improved early drafts of this article. Attending the Bee Audacious Conference in December 2016 is what inspired my thinking on Darwinian Beekeeping, so I also thank Bonnie Morse and everyone else who made this remarkable conference a reality.

Thomas D. Seeley email: **tds5@cornell.edu**

All references for this article are available at **Bees for Development**'s Resource Centre **www.beesfordevelopment.org/resource-centre**

We've got bees!

Pre-order your bees now to be ready for spring!

Package Bees
- #3 package w/ Italian Queen*
- #3 package w/ Purebred Russian Queen*
- #3 package w/ Russian Hybrid Queen*
- NEW! #3 package w/ Saskatraz Queen*

*Marked only

Nucs
5 Frame Nuc with your choice of Marked Italian or Purebred Russian Queen*
*Pickup only

Queens
- Italian Queen*
- Russian Hybrid Queen*

*Marked & Unmarked available

Kelley Beekeeping

SERVING THE BEEKEEPER SINCE 1924

1-800-233-2899

www.kelleybees.com

HONEY COMB

Peter **Borst**

How Do They Do This So Well?

Historical Notes

Since ancient times, people have marveled at the society and the architecture of the honey bees. The following excerpt from "The Fables of Pilpay" gives a glimpse of the thinking two thousand years ago.

They have a king among them, who is bigger than the rest, and whom they all obey; he resides in a little square apartment, and has his vizirs, his porters, his Serjeants, and his guards; the industry of these, and all his other officers, and people in general, is such, that they frame every one for themselves a little six-cornered chamber of wax, the angles of which differ not at all in shape or dimensions, but are so exactly made to answer one another, that the most expert geometrician could not range them with more regularity (Gaulmin, 1818).

It wasn't until the 1600s, that Jan Swammerdam established the fact the the big bee is a female, now called the queen. But the marvel of the geometry of the honeycomb has stayed alive in people's imagination. Mathematicians computed the angles of the cells and Charles Darwin wrote, "the comb of the hive-bee, as far as we can see, is absolutely perfect in economizing labor and wax."

This became a major puzzle for him to understand how natural selection could have produced the honey bee which appears to have arrived at this complex solution to building the most efficient structure to house not only themselves but their resources of honey and pollen, using only beeswax, which they produce in their own bodies. The explanation that bees rely on divine guidance made more sense to people at the time.

In 1852, William Kirby described bees

as those Heaven-instructed mathematicians, who before any geometer could calculate under what form a cell would occupy the least space without diminishing its capacity, and before any chemist existed to discover how wax might be elaborated from vegetable sweets, instructed by the Fountain of Wisdom, had built their hexagonal cells of that pure material, had closed them at the bottom with three rhomboidal pieces, and were enabled, without study, so to construct the opposite story of combs, that each of these rhomboids should form one of those of three opposed cells, thus giving strength to the structure, that in no other place, could have been given to it (Kirby, 1852).

The Geometry of the Cells

Looking at nature, we see the recurrence of geometric shapes, especially the hexagon. Hexagons are notable in geology, such as the six sided pillars of basalt formed by the slow cooling of lava into fantastic rock cliffs, such as "The Devil's Postpile" in California and "Fingal's Cave" in Scotland. More ephemeral, but equally enchanting, are the intricate structures made by aggregates of bubbles. Bubbles, as we all know, form spheres out of the tenuous soapy water membranes. When they are piled up, the surfaces where they touch each other become flat. If the bubbles are nearly the same size, they form neat piles of hexagons.

Further, when multiple bubbles intersect, shapes arise that are very similar to the intersection of cells at the midrib of the bees' comb. Early observers moved past the study of the hexagons to the base of the comb, which consists of equally sized diamonds, or more correctly – rhombs. From "The Garden of Cyrus":

And the Combes themselves so regularly contrived that their Mutual Intersections make three Lozenges at the Bottom of every Cell; which severally regarded make three Rows of neat Rhomboidall Figures, connected at the Angles, and so continue three several Chains throughout the whole Comb (Browne, 1736).

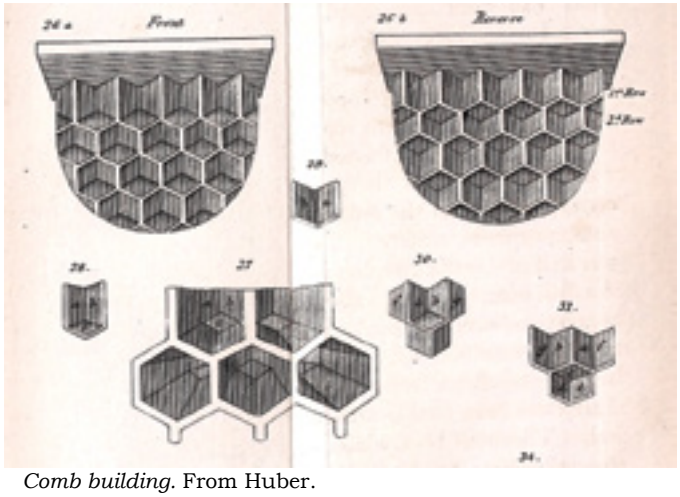
Natural comb building. Borst photo.

Bees with wax scales.

While it's plain enough that a hexagon must contain six equal angles of 120° each, the angles of the little rhombs are a bit more difficult to predict. Early observers found the angles are 110° and 70°. If the larger angle was 120°, the shape of the base would be flat, like manmade honeycomb structures such as cardboard panels. A much smaller value would increase the depth of the cells. But with the bees, the base forms a shallow three-sided pyramid shape that shares its rhombs with three cells on the other side of the comb.

Why this should be so can easily be explained by physics and mathematics, but how did the bees hit upon this shape and replicate it so faithfully for millions of years? A clue lies in the cells of other species of bees and wasps. Solitary *Hymenoptera* make single cells out of various materials such as leaves or mud, in which to place a single egg. When bees and wasps congregate, they make nests consisting of many cells. With the bumble bee, we find piles of small waxen spheres used for storing honey and raising the young.

More organized bees such as the stingless bees (*Melipona*) build elaborate combs, which superficially resemble honey bee combs but with important differences. These bees, and also wasps, make combs with the cells pointing only downward, the comb is not two sided. Looking only at the bases, we see half spheres being used, like groups of bubbles. On the undersides the cells are tightly packed, in the familiar hexagonal rows.



Comb building. From Huber.

Physicists Step Into It

More recently, a group of scientists theorized that the shape of the honey bee comb is accidental and that honey bees are actually trying to make round bottomed cylinders out of wax. In the hot environment of the the hive, the wax melts and flows into the shapes we see, the same way that bubbles or other fluids organize into geometric shapes.

It certainly cannot be the case with wasps, which make their cells out of paper formed from collected plant fibers. They begin with one hexagonal round bottomed cell and surround it with many more of the same until the comb reaches a certain size. Then they build a parallel comb beneath the first and surround the whole thing with an outer shell of paper. This material is never liquid and hexagons are built from the start.

Responding to the idea that the wax becomes fluid in the hive, other researchers took accurate measurements of the internal temperatures, and concluded that they never reach those necessary for wax to flow. Not only that, but it's pretty obvious that if they did the wax would melt and the comb would fall apart. Sometimes theory gets too far removed from observation.

There was quite a controversy, generating papers such as "*Honeybee combs: construction through a liquid equilibrium process?*" in 2004, which asserted that "the comb structure is a result of a thermoplastic wax reaching a liquid equilibrium." This was followed in 2012 by "*Hexagonal comb cells of honeybees are not produced via a liquid equilibrium process*" which countered: "the geometry of the developing cells is generated by mechanical shaping and not by the self-organised process postulated by the liquid equilibrium hypothesis."

The Observations of Huber

François Huber may have been blind, but his study of the comb building behavior of honey bees is without doubt the most painstaking, clear and definitive, despite being carried out two hundred years ago. He began using glass walled hives to scrutinize the internal workings of the hive, employing a trusted and able assistant upon whose eyesight he depended. Being frustrated by the fact that bees generally obscure the view of the comb building, he invented a frame hive which allowed the entire inside of the colony to be observed in real time.

With this access, he could gently brush the bees off the combs they were constructing and study their progress over hours and days by returning to the same comb over time. In 1821 he published "New Observations on the Natural History of Bees," in which he described comb construction in marvelous and complete detail. His work can be easily verified by anyone with a hive of bees and adequate patience. In his words:

The cells of bees consist of two parts, a prismatic hexagonal tube, and a pyramidal bottom. The latter, which must be considered to be most delicate and essential part of the work, is composed of three equal lozenges, similar, uniting in a common centre, and forming a slight cavity by their reciprocal inclination. Their depression into one face of the comb makes a projection on the other, there corresponding to three cells partially common to the whole (Huber, 1821).

The Building of the Combs

Using details from Huber and others, we know that the procedure for building the combs commences when worker bees form a curtain or "festoon," either by clinging to the top of the cavity in which they find themselves, or the underside of a wooden bar provided by a beekeeper, or else the lower edge of a previously constructed comb. Each row of bees clings tightly to the one above and they face each other, with the aim of building a two sided comb between themselves. Once the comb is commenced they can hang on it. Wax producing bees engorge with honey and the wax forms in glands in their abdomen. The pure beeswax appears in the form of a "scale" or flake, which they take up with their mandibles and begin to chew it like a piece of gum, adding saliva.

This is the very point at which we can see if the bees make cylinders which then morph themselves spontaneously into prisms. The first shapes to appear are all flat, thin supports built down from the top and are inflected at precisely the correct angles from the very start. It looks as if the bees are working from some sort of a blueprint which contains the shapes, angles and distances. But soon it becomes apparent from close observation that no individual bee works for long on the project. They move here and there, starting some work and continuing that started by others. It seems clear that they simply assess the situation in progress, continue as appropriate, and scurry off.

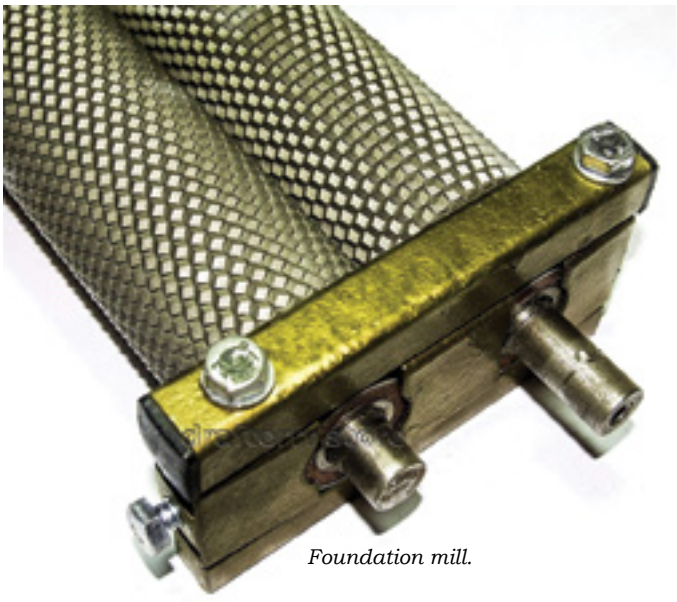
Blueprint or Stigmergy?

The concept of *stigmergy* was developed by French zoologist Pierre-Paul Grassé about 1959. This idea proposes that there is not a blueprint or overall design at all. It proposes that each bee works independently, responding with a set of reflexive rules which are a sort of "*if this, then this*" procedure. Computer programmers used the acronym IFTTT; they create branching sequences of procedures that follow one after the other creating an emergent result based on the variable input.

This model can account for why the comb can be constructed in such consistently repeated symmetry when the space is unobstructed, such as inside the wall of a house. Bees can construct combs many feet tall or wide that are perfectly flat and made up of unbroken swaths of hexagons. However, as the need arises, they can change the direction of the comb, winding it to fit irregular spaces, around obstructions, etc. They have the capacity to improvise as needed and to create novel and unexpected shapes and solutions. They do not proceed mechanistically and blindly like a train on the rails, but adjust themselves to whatever space they have occupied.

Stigmergy further supposes that honey bees are not really coöperating in the way that people tend to romanticize that they do. It suggests that each bees is working independently, not really cognizant of the whole structure, or "purpose" of the hive. The great form that we see and admire is the result of thousands of workers proceeding independently, guided by behaviors that have led to success in the past, and have been preserved through time by evolution, which tends to keep successful adaptations while sacrificing those creatures which fail to adapt. Oldroyd and Pratt describe it like this:

Close observation of honey bees shows that each cell emerges from small contributions by many workers rapidly coming and going at the building site. Stigmergy allows any worker to pick up where the last one left off, as long as every worker follows the same rules (Oldroyd, 2015).



Foundation mill.

Darwin's Conundrum

Charles Darwin took many years to construct his theory of evolution by natural selection. During this time he challenged himself by looking beyond the apparent results that evolution had produced, to the obstacles his theory would have to overcome to be fully explanatory. One of these was the honeycomb, which had always been seen as an example of the expression of God's plan by His creatures.

Not only did Darwin intend to challenge this firmly entrenched system of beliefs, but he needed to supplant it with a new system in which people could believe, if it offered a sufficiently strong explanation. In his own words, "I am half mad on the subject to try to make out some simple steps from which all the wondrous angles may result." According to Sarah Davis:

In the Origin, Darwin wanted to show that simple, repeated actions, such as the excavation of excess wax, could result in complicated structures. This is a lesson that applied not only to honey bees, but also to other creatures' structures, such as spiders' webs, birds' nests and beavers' dams. The message from Darwin was that instinct could result in seemingly intelligent actions and behaviour, despite the animal not actually reasoning about what it is doing (Davis, 2004).

In order to obtain firsthand observations of honey bees, Darwin made friends with William Tegetmeier, who was an experienced apiarist. They corresponded regularly between 1855 and 1881; Darwin's son Francis remarked that his father had full trust and respect in the judgement and knowledge of Tegetmeier. Many of the observations were made at the "Experimental Bee House for exhibiting the working of scientific and improved hives" operated in the 1860s by the Apiarian Society of London. It contained numerous glass walled hives so that bees could be observed regardless of the weather outside.

Darwin cited Tegetmeier in his book when he discussed the economy of wax production. Tegetmeier

told him that nectar is seldom abundant and that great quantities of it are required to produce small amounts of beeswax. As much as twelve to fifteen pounds of dry sugar would be converted into one pound of wax, he said. Further, even greater quantities would be needed for winter consumption, so there was a strong incentive to use as little nectar as possible to make wax and also to store it in a structure which has the strength and integrity to support the weight of the honey and the bees, which cling to the combs.

Reinforcements

Pure fresh beeswax has great tensile strength, but over time the combs are modified in ways that greatly increases it. Referring again to Huber, he described in detail how the bees gather propolis, which is sap and resins from certain trees, and apply it to the surface of the completed combs. Much attention has been paid to the antiseptic properties of propolis and no doubt the colony benefits from that, but it appears that the chief virtue of it is that it can be used to improve the wax.

Propolis requires much less energy to produce, having only to be gathered and applied where needed. They use it as a sort of varnish, not only on the combs but on all the interior surfaces of the hive. Sometimes they build great structures such as entrance reducers, making the opening to the hive much smaller and easier to guard. Many new beekeepers are concerned by the darkening of the fresh white wax, which over time becomes yellowed, brown and finally dark black. This is mainly caused by the propolizing of the combs. Eventually, the combs become very tough and durable, much less prone to breaking than newly built combs.

The field of beekeeping was revolutionized by the invention by Langstroth of a practical bee hive consisting of boxes fitted with moveable frames in which the bees are induced to build their combs. This was quickly followed by two other revolutionary inventions: the centrifugal honey extractor and honeycomb foundation. While tough old combs could have the honey spun out them using the new machine without damage, new combs were tender and often broke apart in the machine.

The solution was the manufacture of honeycomb foundation, sheets of pure beeswax imprinted with cell bases, that could be mounted in the wooden frames and reinforced with wire. Combs built upon this foundation had the added advantage of being less liable to sag over years of use, although they did tend to stretch and buckle eventually. This fact kept inventors working for a century, trying all sorts of so-called improvements including laminating the beeswax on both sides of a sheet of paper. In the 1920s, the bee magazines were abuzz with talk about bee combs made of aluminum. From the journal "The Western Honey Bee," April 1922:

> *These combs present a number of advantages which will appeal to any beekeeper. Drones are effectively controlled. Danger from destruction of combs by wax moth is eliminated. Melting down of combs is rendered impossible. These combs will not break or "buckle" in the extractor, and because the baskets can be revolved more vigorously, they can be extracted much more cleanly (Biggs, 1922).*

Aluminum combs proved to be a short-lived fad, I couldn't find any references to them after 1930. But that didn't stop the inventors, by the 1960s you could purchase foundation that had embedded wires, or laminated with plastic film.

Finally, in 1971 Paul Pierce patented an entire frame and foundation manufactured out of hard plastic. These days the most popular configuration is a traditional wood frame fitted with a hard plastic comb base, which is lightly sprayed with beeswax coating to make it more acceptable to the honey bees. They faithfully build their comb upon this sturdy foundation, making it nearly indestructible and useful for many decades.

Parting Words

I would like to conclude with the words of Anna Comstock – who in 1908 became the first female assistant professor at Cornell University – from her "Handbook of Nature-study:"

Some have tried to detract from bee skill, by stating that the six-sided cell is simply the result of crowding cells together. Perhaps this was the remote origin of the hexagonal cell; but if we watch a bee build her comb, we find that she begins with a base laid out in triangular pyramids, on either side of which she builds out six-sided cells. A cell just begun, is as distinctly six-sided as when completed (Comstock, 1918). BC

Questions or suggestions? Write me at ***peterlborst1@icloud.com***

Works Cited

Bauer, D., & Bienefeld, K. 2013 *Hexagonal comb cells of honeybees are not produced via a liquid equilibrium process.* Naturwissenschaften, 100(1), 45-49.

Biggs, F.W. 1922 *The Value of Aluminum Combs.* The Bee-keepers' Review, Volume 35.

Browne, Thomas. 1736 *The garden of Cyrus.* London.

Comstock, A.B. 1918 *Handbook of nature-study for teachers and parents: Based on the Cornell nature-study leaflets, with much additional material and many new illustrations.* Comstock Publishing Company.

Davis, S. 2004 *Darwin, Tegetmeier and the bees.* Studies in History and Philosophy of Biological and Biomedical Sciences, 35(1), 65-92.

Gaulmin, G., & Harris, J. 1818 *The Fables of Pilpay.* Baldwin Cradock, and Joy,. London.

Huber, F. 1821 *New observations on the natural history of bees.* W. & C. Tait, and Longman, Hurst, Rees, Orme, and Brown, London.

Kirby. 1836 *On Wasps and Bees.* The Saturday Magazine. Volumes 9-10 - Page 238

Oldroyd, B.P., & Pratt, S.C. 2015 *Comb Architecture of the Eusocial Bees Arises from Simple Rules Used During Cell Building.* In Advances in Insect Physiology. Vol. 49.

Pierce, P.W. 1971 U.S. Patent No. 3,579,676. Washington, DC: U.S. Patent and Trademark Office.

Pirk, C.W.W., Hepburn, H. R., Radloff, S. E., & Tautz, J. 2004 Honeybee

Dadant

Beekeeping & Honey Bees - Our Business Since 1863

AP23®

Artificial Pollen 23

WINTER PATTIES

Dadant's winter patties are a multifunctional patty, high in carbohydrates and 3% protein to help keep your colonies strong through the winter months.

Contains: sugar, AP23 and Honey-B-Healthy

- Can be used in winter & early spring in place of candy boards
- Readily accepted by the bees
- Convenient for all beekeepers
- Currently available at your nearest Dadant branch location

• 51 S. SECOND STREET, HAMILTON IL 62341 • PHONE (217) 847-3324 • FAX (217) 847-3660 • TOLL FREE 1-888-922-1293 •
• CHICO, CA (877) 332-3268 • FRESNO, CA (877) 432-3268 • PARIS, TX (877) 632-3268 • SIOUX CITY, IA (877) 732-3268 •
• WATERTOWN, WI (877) 232-3268 • ALBION, MI (877) 932-3268 • WAVERLY, NY (877) 532-3268 •
• CHATHAM, VA (800) 220-8325 • FRANKFORT, KY (888) 932-3268 • HIGH SPRINGS, FL (877) 832-3268 •

dadant.com

FOUND IN TRANSLATION

Social Status And The Single Bee

Jay **Evans**, USDA Beltsville Bee Lab

After 20 years in a honey bee research lab, I am biased towards this hero of the air, agriculture, and environment. That being said, it helps to reflect on the diversity of bees worldwide and the many ways they persist. The vast majority of the world's 20,000+ bee species live as 'single moms'. Here, female bees gather pollen and nectar over hundreds of trips, packing these resources into tunnels or other cavities and laying a single egg atop each 'pollen ball'. They then seal things up and die without meeting any of their offspring. Additional bee species nest communally (think cliff swallows, or bats in a cave). Very few bee species form truly social colonies. Of the social bees, even fewer form huge, highly interactive societies like honey bees. Nevertheless, honey bees show their bee roots in many ways, from their flight muscles to their needs for pollen and nectar and their general sensitivity to chemicals. Similarly, solitary bees show many traits found in their social relatives, from repeated risky trips to collect food they will never eat to an ability to choose which eggs will develop into male versus female offspring.

A few species teeter on the edge of sociality, with female offspring sometimes staying with their mothers to help raise new females and sometimes setting off to mate and try their luck alone. This switch can reflect genetics or environmental conditions such as the time of year or the availability of resources. Sweat bees provide some of the best-known and best-studied examples of 'polymorphic' sociality. The late Cornell bee scientist George Eickwort worked painstakingly to describe the biology of the widespread North American sweat bee *Halictus rubicundis*. This generally social species shows a solitary lifestyle in regions with a short growing season, such as high in the Colorado Rocky Mountains (**https://www.jstor.org/stable/4601196**). While Eickwort and others (including his children) investigated burrows of *Halictus* with spoons and tiny flags, Cécile Plateaux-Quénu was studying a similar sweat bee, *Lasioglossum albipes*, in France. Populations of this species found in locations with longer, warmer, summers tend to be social. Here, female foundresses produce a small number of workers (all female) and males each Spring. The workers then stick around to collect food for a second generation of female sisters and males. This second generation mates, whereupon males die (another similarity with honey bees) and females dig in for Winter before emerging and starting new nests the following Spring. Social habits seem to have a genetic component of some sort in this species, in that females from the social and solitary forms who are collected and placed in identical environments are faithful to their original social behaviors (**https://link.springer.com/article/10.1007/PL00001713**). The ancestor of *L. albipes* was consistently social, so this is really a story of a social bee that sometimes opts for a single-mom life, with eggs left to hatch on their own, and sometimes sets the stage for a generation of daughters to stay around and invest in the family business.

The fascinating biology of *L. albipes* might have faded from view had this species not attracted the attention of Princeton biologist Sarah Kocher (**https://www.kocherlab.com/**). Kocher carried out years of field work to further describe the social habits of these bees, in time identifying more solitary and social populations across France. With students and colleagues, she then began an experimental dissection of what makes members of this species opt for producing largely sterile workers at times, and only future egg-layers at other times. These efforts are now shedding light on social traits shared with honey bees and other insects, and perhaps even ourselves. One study, published in 2017, (**http://www.pnas.org/content/114/25/6569**) showed that the social forms of *L. albipes* have consistently more sensilla, organs on their antennae known to be involved with picking up chemical cues, when compared to solitary populations. Looking across 36 sweat bee species, solitary species that were at the tips of social lineages tended to carry fewer of these smell-sensing sensilla. Sensilla are key for picking up on subtle social cues in bees (and ants!) and the authors propose that the apparent loss of these organs in solitary species is analogous to the decrease in eye size found in fish or other species that inhabit caves. Put another way, these organs are likely costly for bees, and if they are strictly involved with social behaviors, then solitary bees do better without them.

Not content to measure behaviors or antennal organs alone, Kocher and crew sequenced the genome of this bee (at the time it was one of the first bee species to have it's genome exposed to scientists) and used this blueprint of bee proteins

KOCHER LAB

to further explore social and solitary differences. This past month, they published a stunning paper that gives a comparative look at the genomes of 143 bees from both social and solitary populations of *L. albipes* (**https://doi.org/10.1038/s41467-018-06824-8**). The study confirms that social life is optional in this species, with bees from specific regions tending to be social and from other regions tending to be solitary. Social bees shared common traits in their genomes, giving the best view yet of specific proteins and protein variations that might help drive sociality. The most striking variation was found near the gene encoding the protein syntaxin 1a. This protein is known to be over-expressed with respect to social behavior in other species and is even, ta-da!, known to be involved in the learning of smells by honey bees. Sure enough, social sweat bees over-expressed this protein relative to solitary ones, consistent with a direct role in social communication. Other genes linked with sweat bee sociality also showed connections to the behavior of honey bees, and even humans, a topic that will take more time to explore. It remains to be seen how these results will improve our understanding of how honey bee societies work, or be used to improve beekeeping. Still, comparative studies across bees that are social, solitary, or on the fence, are clearly poised to inform what it takes to make highly social insects like honey bees succeed. BC

Hypothetical

Stephen **Bishop**

At the only stoplight in Polkville, North Carolina, a log truck creeps forward and begins to move through the gears. The payload is 16-foot peeler logs, destined for a mill in Old Fort. Once at the mill, the logs will eventually be loaded onto a large conveyer belt and cut into two smaller eight-foot logs. These small logs will be conveyed to a lathe that spins each log against an eight-foot blade, peeling off a continuous sheet of veneer. These sheets of veneer will be trimmed to four-foot by eight-foot sections that will be lathered in glue, stacked, and pressed into plywood. The plywood will be shipped to home improvement stores throughout the country.

Years ago, as a forestry student, I had a chance to tour the mill in Old Fort that specializes in producing poplar plywood. Poplar plywood is high-dollar stuff, and that log truck in front of me will provide some landowner with a nice paycheck.

Now as a beekeeper, I value poplar differently than I did as a timber cruiser. Instead of calculating board feet, I sometimes look up into a towering poplar and try to guesstimate the number of blossoms and how those blossoms might affect my honey supers.

By poplar, I should specify here that I'm referring to *Liriodendron tulipifera*, which is a magnolia, not a poplar. But loggers thought the wood was lightweight like poplar, so they started calling it tulip poplar. The name stuck, and most people around here now truncate it to "popler."

For beekeepers in the foothills of North Carolina, poplar is the main event. Some years, this event lives up to its billing. In other years, it's KO'd in the first round by Mother Nature. Before you realize the trees even bloomed, orange-creme petals are melting away on the ground. In other years despite perfect weather and all indications that the flowers are producing plenty of nectar, the bees seem to prefer bounty from other plants, say blackberry or black locust. But in a good poplar year, which climaxes with a good and utilized poplar bloom, bees can fill supers in a hurry – full of dark honey with a faint reddish tint and a tinge of earthiness, as if the distilled nectar that comprises that honey once originated deep from a headspring guarded by big poplar roots.

In days gone by, when men searched for a headspring, usually to set up shop for another type of distilling, a big poplar or clump of big poplars guarded the spot. Historically, poplars grow best in moist areas, in the rich soils of bottoms and lower slopes along creeks and branches. Their territory has expanded up slope with our penchant for putting out forest fires. Unlike some hardwoods and oaks, tulip poplars have no fire-resistant adaptations, but can grow incredibly fast and outcompete species in drier areas that depend on fire for a competitive advantage. They are also prolific seed producers, which is good news for beekeepers.

Consider this: researchers determined that a 10-inch diameter tree in North Carolina produced 750 cones and 7,500 viable seeds. A 20-inch diameter tree produced 3,250 cones with 29,000 viable seeds. That is 750 and 3,250 blossoms respectively. So, back to the question: how much are those beautiful blossoms worth in terms of honey production?

Way back in 1933, USDA apiculturist G.E. Marvin was curious about this as well. He set up shop on the branch of a 15-inch poplar in North Carolina. On that branch, he wrapped 32 blossoms in cellophane and periodically swabbed the blossoms with cotton swabs. He then weighed the swabs and determined that the average poplar blossom produces 1.6417 grams of nectar. He also calculated that the total number of blossoms on that tree was 2,484. He multiplied these numbers together and rounded to 4.1 kg of nectar produced, or 9.02 pounds. This nectar had a water content of 83.3% and to thicken to honey it needs to be 20% or less. So, drum roll please, Mr. Marvin determined that a 15-inch poplar could produce enough nectar for 2.16 pounds of honey – the key word being *could*.

That 2.16 pounds doesn't seem like a lot, but considering a mature mixed-hardwood forest might have many dozen big poplars per acre and bees can forage over 1500 acres in their range, the numbers add up and those orange poplar blossoms look like green dollar signs in the sky. The problem with calculating this hypothetical honey yield is that 2.16 pounds is based on the perfect scenario, or the cellophane scenario. Because poplar blooms relatively early in the progression of blooming plants, often hives are not in peak shape to gather all that nectar. And poplar nectar doesn't last long. People have reported the phenomenon of raining nectar during a breeze under poplars. That falling nectar will never darken a honey jar. On hot days, ungathered nectar literally dissipates into the sky.

So how much is a poplar worth? That's a good question. I will still ponder it when I see a log truck full of poplar logs or when I gaze into a canopy of blooms. If I had to answer, I would probably say a one-pound jar of honey in the hand is worth more than 2.16 pounds of honey in the heavens. BC

Listening To The Bees About Diversity

Mark **Winston**

Bees teach us that leaders best serve society when they promote core ideals that unite rather than divide

These are tough times for diversity in the Western world, with democracies convulsed by the linked trio of systemic racism, a copious flow of refugees from impoverished and war-torn regions, and rising xenophobia. Ironies abound, particularly in the United States, a country whose ostensible values celebrate tolerance yet in practice is spinning the rich diversity of its citizens toward conflict between "us" and "them."

One of the hallmark benefits of diversity is providing perspectives through different lenses. The two of us have been involved in a writing project focusing our quite different personal backgrounds in the direction of bees. One of us is a Jewish entomologist originally from Brooklyn but raised outside of Cleveland, Ohio, while the other is a poet, daughter of a Hindu Brahmin father and a Muslim mother, born in India and raised in various small towns across Canada. Our collaboration has itself benefited from that diversity, drawing on Mark's research interest in bees stretching back over a 40-year career, and Renée's lifelong interest in poetry inspired by bees as muse.

Bees Do Not Cloak Reality With Lies Or Fake News

Together we've been metaphorically listening to what we might learn from bees about the nature of diversity. This is a particularly compelling time to view bees from this merged sensibility, as they are in deep trouble. Forty percent or so of managed honey bee colonies die each year, replaced at great cost by beekeepers, and the thousands of unmanaged bee species living in our fields, farms and forests are similarly in precipitous decline. The factors underlying this apian tragedy are now well-known: a synergistic interaction between pesticide impact, diminished diversity and abundance of floral resources, and diseases and parasites.

Honey bees colonies are particularly instructive because they are highly social, like us, and also quite diverse, made up of stepsister workers with the same queen mother but 15-20 drone fathers that inseminate the queen early in her life. The hive population may reach 50,000 individuals, but each subgroup of sisters expresses its own characteristics.

Colonies appear homogeneous at first quick glance, but after long hours in apiaries, composed of thousands of instances opening up hives, harvesting honey, preparing bees for Winter, and inspecting colonies in the Spring, colony diversity becomes palpable. Even superficially the worker bees show visibly different colors, with some almost jet black while others may be yellow or brown. And, there is substantial behavioral variance between stepsisters, particularly in the ages or likelihoods at which they perform particular tasks in the hive. Some, for example, may be more likely to forage for nectar or pollen, others begin rearing larvae at younger ages, while another group of sisters tends toward defending the nest.

Research has measured the benefits of this diversity, including increased colony effectiveness at finding and collecting food, heightened levels of disease resistance and improved hive-level temperature regulation. But perhaps most significant is resilience, with diverse colonies able to respond quickly and effectively to challenges such as predator attacks or opportunities such as a field of nectar-producing flowers coming into bloom.

Diversity alone is not sufficient; honey bees must communicate with each other rapidly and thoroughly if these diverse subgroups are going to successfully weave their individual activities into common purpose. To be immersed in a honey bee colony is to be awash in a constant flow of information, with messages transmitted chemically through pheromones, physically through vibration and sound, and visually and tactically through dances and ritualized behaviors.

Notably, honey bee workers spend considerable time in the hive listening to each other, picking up information about what needs to be done within the colony and what might be happening outside that requires their attention. Each bee has its own perspective, based on experience and genetic background, but it is the sum of these points of view that provides the full set of information about how the hive's collective wisdom might best focus on work that promotes colony well-being.

Honey bees also provide an important metaphor for leadership. The queen is not a monarch in the human sense. Rather, through her pheromones that circulate through the nest she sends a message to the worker bees that commitment to their colony is key to survival.

Honey Bee Workers Spend Considerable Time In The Hive Listening To Each Other, Picking Up Information About What Needs To Be Done Within The Colony And What Might Be Happening Outside That Requires Their Attention.

Instead of commander-in-chief, we might think of her as conscience-in-chief, reminding the bees that the society they hold in common is more important than their individual differences.

There also is much to be learned about diversity from wild bees, which mostly build solitary nests in the ground or in hollow twigs. Many inhabit our cities, and do well in urban areas because they thrive in the in-between, folding themselves precisely into interstitial habitat cracks, foraging on the great variety of flowers present in metropolitan areas.

Myriad small but highly varied urban micro-ecosystems are surprisingly hospitable to bees, from backyard gardens to empty lots, parks to roadsides. As a result, cities host among the highest levels of bee diversity and abundance of any global habitat. But it's not a one-way relationship; nature in the city would not exist without the pollinating power of bees, and the bees could not thrive without the nesting habitats and floral resources provided in cities.

Wild bees are doing quite a bit better in cities than on our farms, where their diversity could provide an ecological pollination service instead of the current system that requires managed honey bee colonies to be trucked in during bloom, often from thousands of miles away. Large-scale contemporary agriculture, with its heavy dependence on pesticides and extensive single-crop acreages, is a harsh environment for wild bees. Yet, when sustainable agricultural practices with reduced pesticide use and mixed cropping are implemented, wild bee populations recover sufficiently to pollinate crops, so that their diversity becomes of direct benefit to us.

Bees, of course, are not us, but paying attention to how bees manage and express diversity provides insights into what we lose when diversity falls prey to xenophobia. Like honey bees, we benefit from variation, providing flexibility and resilience to human societies. Honey bees also remind us that an unfettered, constant flow of reliable information is critical for decision making. Bees do not cloak reality with lies or fake news, but rather pass around pure information unhindered by politics, so that their nest mates can make wise decisions that benefit their community.

Bees also teach us that leaders best serve society when they promote core ideals that unite rather than divide. We can be quite different from each other politically, culturally, socially and spiritually, but only if we share a vision that celebrates differences while emphasizing our underlying common values.

From wild bees we learn another important trait of both biological and human systems: diversity begets diversity, creating stable, durable communities. The small and unnoticed wild bees can be powerful healers of disrupted habitats, while for us the daily work of a diverse citizenry creates the healthiest communities.

We, like nature, thrive when diversity blooms. Listening to the bees should remind us that diversity is more in our self-interest than bashing those different from us, because it's those differences that make our nations, like bees, the most durable and successful. BC

Mark L. Winston *is a scientist and Senior Fellow at Simon Fraser University's Morris J. Wosk Centre for Dialogue, in Vancouver, British Columbia.* ***Renée Sarojini Saklikar*** *is a lawyer and poet and recently completed a three year term as the first Poet Laureate in Surrey B.C. Together they have co-authored the recently published book* Listening to the Bees.

For correspondence:
Mark L. Winston, FRSC, Professor and Senior Fellow Morris J. Wosk Centre for Dialogue, Simon Fraser University, 3309-515 W. Hastings St., Vancouver, B.C. V6B 5K3 Canada 778.782.7894; **winston@sfu.ca**

Which Electronic Hive Scale Is For Me?

A Beekeeper's Guide . . .

Jonathan **Engelsma,** Karen **Rennich,** James **Wilkes,** Michael **Wilson**

To the best of our knowledge, in 2012 there was only one electronic hive scale commercially available to beekeepers here in the USA, and it cost over $1,500 to purchase with an additional $10-$25 monthly fee to operate! Fast forward to 2019 and there are a number of options available for the beekeeper, some for less than $300 per unit. As adoption of electronic hive monitoring products increases over time, we expect the purchase price and operating costs will continue to decrease as well. There are so many options available today that you might be wondering which of these hive scales is best for me? The best answer will vary by individual beekeeper, depending on his/her unique situation, budget, and other factors. The products available today differ in a number of ways, including the wireless technology used to transmit data, accuracy, form factor, battery technology, usability, and overall cost to own/operate. In the remainder of this article we will attempt to provide you with some pointers that are aimed to help you decide which electronic hive scale product might be best suited for your apiary.

Why use an electronic hive scale in your apiary?

Perhaps before we discuss some of the technical details of electronic hive scales, we should address the question of why you should consider using an electronic scale in your apiary in the first place. Afterall, the $300 investment would easily add another colony to your operation. There are a number of reasons why you should consider electronically monitoring the weight of a colony in your apiary. Here are a few obvious ones that come to mind.

Reason #1 – More locality specific information that will be useful in making management decisions in your apiary. The weight of your colony, or more accurately, the change in weight over time of your colony actually conveys a fairly significant amount of information about the colony, and possibly nearby colonies as well. For example, rapid increases in weight during the spring may indicate it's time to add honey supers. Daily decrease / increase cycles may indicate colony viability and health (see Figure 1). A sudden mid-day drop of a few pounds during the right time of the year, may indicate a swarming event. Very little change of weight or gradual loss may indicate a nectar dearth. Weighing a colony while feeding it helps you get an accurate estimate of how much of the feed is being stored vs. consumed for maintenance, and yes, if you've never actually monitored a hive while feeding, you'll be surprised at how much of the feed is being consumed vs. stored! Furthermore, all of this information is available 24 x 7, as the capture of data is automated and continuous at intervals of 15 minutes or less in most products.

Reason #2 – Some hive scales operate in an entirely automated

Figure 1. *Plot of a healthy colony's weight during nectar flow on Bee Informed Partnership's Hive Monitoring Portal. Note the cycles of weight gain during daily foraging, and then the loss of weight as moisture is evaporated overnight.*

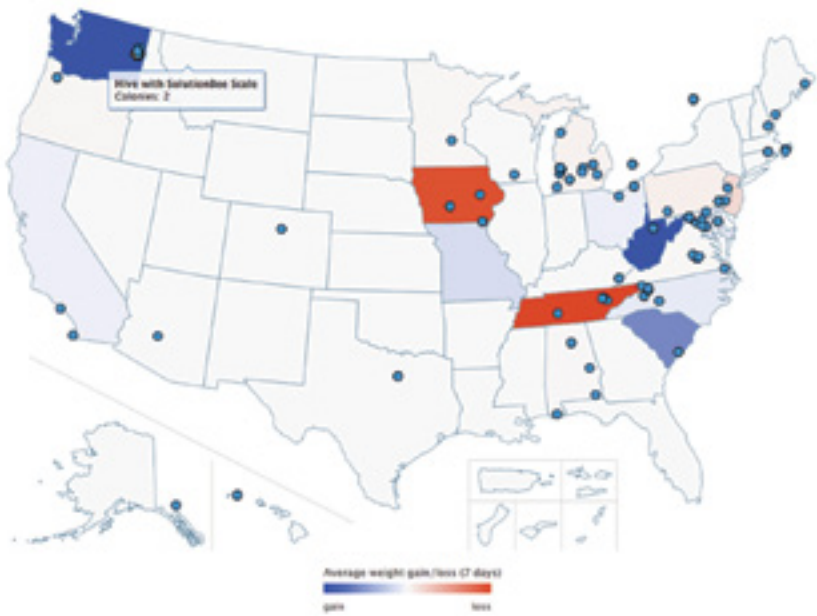


Figure 2. *The Bee Informed Partnership's Hive Monitoring Heatmap – average aggregate loss/gain in weight by state.*

mode, where they transmit weight data continuously over a wide area wireless data network (typically cellular or satellite). These units can be setup in a remote apiary and monitored from afar via the Internet. For a sideliner or commercial beekeeper with apiaries spread over a larger geographical area, a number of strategically deployed electronic scales could help provide an automated stream of actionable data that could inform and help optimize management decisions. In addition, many of the products available today also support alert mechanisms that trigger when a certain weight gain/loss threshold is crossed, or the unit itself is moved. This kind of feature could help detect theft or even a marauding bear.

Reason #3 – Be a citizen scientist! Since 2013, the Bee Informed Partnership (BIP) has been operating it's nationwide hive monitoring network and sentinel apiary program. These programs allow individual beekeepers or beekeeping organizations to automatically share data from their apiary with BIP. BIP in turn makes the aggregate data actionable to the public beekeeping community. For example, there is a heat map of the USA that shows the aggregate average loss/gain in weight for each state of the USA over the past seven days. This data is based on the 500+ live scales in the BIP hive monitoring network. This provides beekeepers everywhere with a quick visual on the average colony weight in their home state. In addition, users can drill down on a nearby sentinel apiary in their locality and check its weight as well as any reported disease load data (mite and nosema counts). Making your data usable to you, your county and the country makes the data all that more valuable! The BIP platform also allows you to share your data within the portal, which is a great feature for bee clubs that own a scale and want to share the data within their club.

Where's the data?

Perhaps one of the most significant features to be aware of when considering a particular hive scale, is what options are available for actually collecting the data. That is, how does the data get transmitted from the actual physical hive scale, to a server in the *cloud* (e.g. a computer in a data center that can be accessed via the public Internet) where it can be subsequently viewed via a website, or mobile app?

There are basically two different approaches to data collection:

- Automatic, unattended transmission of data via a wide-area wireless data network (cellular or satellite).
- Hi-tech "sneaker" network - that is, the beekeeper must visit the apiary where the scale is located, and collect the data via a smartphone. This is typically accomplished via local low power radio technologies such as Bluetooth or Near Field Communication (NFC). The smartphone then uses its wireless data service (cellular or WiFi) to transmit the data to the cloud.

Some hive scale products support both of these approaches, while others support only one or the other. The former approach is advantageous in that the data flows automatically without having to visit the apiary in person. However, this feature typically involves recurring costs, such as a monthly cellular plan (for as little as a few dollars a month) or much more expensive satellite data services. The latter approach is more economical, in that it only involves the initial cost of the platform, and not additional recurring monthly data service charges. However, it should be mentioned, that some scales also work via WiFi which is ideal for backyard beekeepers who have an apiary situated close enough to their home that the scale is within range of their WiFi access point. This is the best of both worlds in that data is transmitted automatically, without data service costs beyond what they are already paying for their home Internet service. Another interesting feature some of the vendors support is that of a special gateway device (or the scale itself behaving as a gateway device) that enables multiple scales at a given site to use local connectivity to connect to the designated gateway device (via Wifi, Bluetooth, etc). The gateway device has a cellular interface and can transmit data on behalf of a multiplicity of co-located scales. This is an advantageous approach for supporting multiple scales on a single shared SIM card.

Figure 3. *One of the authors collects data from a Solution Bee scale that uses Near field communication (NFC).*

Where's the juice?

All of the scales we've worked with are battery powered. Some of them use more expensive custom battery packs that have a much longer life than those that use standard batteries. Some manage to get up to five years of life out of a standard lithium battery by using a variety of interesting power saving features, such as powering down at lower outside temperatures, or allowing the user to dial back on the sample or transmission rates! There are a number of things to be aware of when it comes to comparing the various battery options. First of all, many of the units must be removed from under the hive in order to replace the battery. If your battery goes dead during the height of the honey flow, that could be quite a chore! Units that require more expensive batteries or use various power saving techniques to get more lifetime out of the battery may be advantageous to you, if you prefer not to have to break down your sky scraping hive when the battery goes dead. Alternative, just like replacing the batteries on smoke alarms, plan on replacing your batteries right before you add supers.

Similarly, if you are interested primarily in automated monitoring of remote colonies, battery life is likely going to be an important consideration in making a purchase decision.

However, if you live in an area where honey flows are short lived, or if you're into varietal honeys and harvest frequently from hives in your backyard or nearby, a unit that uses a standard battery without any power saving features may be acceptable to you.

It should be mentioned as well, that some of the vendors support rechargeable batteries. While this doesn't really impact any of the issues discussed above, it does mean you save on operating costs by not having to purchase replacement batteries over time.

What's up with my load cells?

The accuracy of all scales will vary, depending on the quality of components used as well as how the scale is designed. Electronic hive scales compute weight using sensors referred to as load cells. These devices produce an electrical signal whose magnitude is in proportion to the amount of strain that is placed upon them. Accuracy can be influenced by the number and quality of load cells used by the scale. For example, some hive scales use four cells to compute weight, while others use only two and require the user to balance out the hive with an additional prop. Using fewer load cells can save on manufacturing costs which would typically translate into a savings on purchase cost for the beekeeper, at the cost of less accuracy.

Another potential factor influencing accuracy is whether or not the load cells are temperature compensated. Such load cells are more expensive than the alternative, yet if you are operating the scale in an environment with frequent and significant temperature fluctuations, scales without temperature compensation will not be as accurate.

Figure 5 demonstrates the impact of temperature on the sample weight over time. We took three commercially available hive scales and stacked them in a sheltered area that was exposed to sunlight. The weight on each was constant overtime, yet as the temperature varied, particularly on the fourth day of the experiment when the sunshine broke through the otherwise cloudy November Michigan weather, the impact can be seen to varying degrees on the individual scale units.

For many beekeepers, absolute weight accuracy is perhaps not as important as overall consistency in a variety of conditions, as well as the *change* in weight over time. Compromising on quality of load cells might not be as big of a problem for a backyard beekeeper who is interested in observing the change in weight of their colony over the honey flow, but could be a problem for a researcher in a university who is using the weight data in a scientific study, or a beekeeper who plans to contribute their data to scientific projects as a citizen scientist.

Where's Tech Support when you need them?

Another very important consideration in purchasing an electronic hive scale is the overall usability of the product. Back in 2013 when our BIP IT team first started working with electronic hive scales, the first unit we got our hands on (e.g. the one that cost

Figure 4. *OEI's WiFi Hive Scale comes with a battery charger which can be plugged in via a standard mini-USB cable.*

$1,500!) took one of our graduate students (who happened to have an undergraduate degree in computer engineering) several days and many emails to the vendor's tech support people to simply get the scale up and running! Not only were the software interfaces convoluted and difficult to understand, but the scale required a specific version of a specific operating system in order to connect to it!

Fast forwarding again to 2019, happily there are a number of highly usable scale products available to beekeepers. In fact, this is an area where BIP can really help! Given the usability challenges we experienced with some of the pioneering hive scales, as well as our own experience watching the average beekeeper completely destroy every usability assumption we make in crafting BIP's software, we've long insisted that any electronics product created for the beekeeping community has to be absolutely *idiot-proof*. (We won't disclose who BIP's resident idiot is.) In our experience, most beekeepers tend to be curious tinkers. If there is a button, beekeepers will assume it's meant to be pushed. If pushing the button once is a good thing, then pushing it ten times in quick succession or holding it down for 30 seconds has to be spectacular!

Hence, several years ago as more scale products found their way to the market, and our own BIP

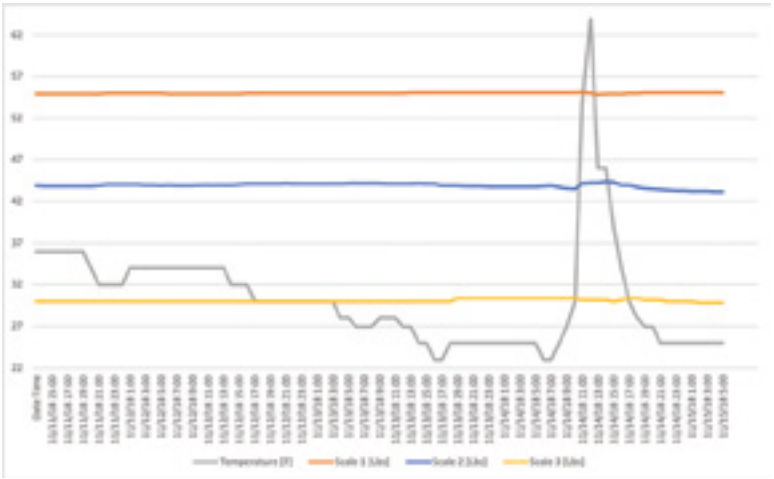


Figure 5. *The impact of temperature on weight captured from a stack of scales. Actual weight subjected to each unit is constant, but degree to which the load cells are compensated for temperature varies.*

Hive Monitoring Network grew, we launched our Bee Informed Ready™ logo. Hive monitoring products that are designated as Bee Informed Ready™ are products that our team has carefully evaluated. Not only do we validate the product functions as advertised, and integrate correctly with BIP's hive monitoring network, but we also evaluate the usability, documentation, instructional videos, and technical support provided by the vendor. During the evaluation period, we work closely with the manufacturer, providing them feedback along the way and giving them time to make any necessary improvements before they become a designated Bee Informed Ready™ product. This improves the design and manufacturing of these products and hopefully results in a better product to the beekeeper. As an aside, to give credence to what we say here and on our website, more than 75% of our IT team are also long time beekeepers.

Today there are five manufacturers who have achieved this designation, all of which are listed on the BIP website (**https://beeinformed.org/programs/sentinel/**). All of these products are available for purchase by beekeepers in the USA. While we do not recommend a specific manufacturer, we do stand by all of these vendors. We also publish some of the trade off decisions discussed in this article on a per vendor basis at that same website above based on our experiences during testing, evaluation and interactions with the vendors. Should readers have questions about specific models, we'd recommend you contact the vendors directly, as all of them have proven to be very helpful and responsive to the beekeeping community.

We hope this article will be useful in helping beekeepers better understand some of the decisions that need to be made when trying to decide which electronic hive monitoring product to purchase. BC

Figure 6. *BIP's Bee Informed Ready™ logo. Hive monitoring products with this designation fully integrate with BIP's national hive monitoring network and are recommended to beekeepers for their overall usability and vendor support.*

Additional Carrot Family Herbs As Bee Plants

Connie **Krochmal**

Yes, there are still more species of herbs in the carrot family that are suitable for bee gardens. This month, we'll consider goutweed, cumin, and coriander.

Goutweed (*Aegopodium podagraria)*

Also known as bishop's weed, this coarse looking perennial was originally native to Asia and Europe. Worldwide, there is a related species although it isn't cultivated. The genus name comes from Greek words that mean goat and little foot in reference to the leaf shape. The species name also means foot.

Goutweed arrived in England during the Middle Ages. At that time, the plant was grown for the leaves, which were cooked as a green. They have a somewhat spicy flavor. In addition, these served as a remedy for gout, which explains the common name.

In England, this was also known by other common names, including dog elder. Goutweed was mentioned in John Gerard's "*The Herball,*" which was published in 1633. He described the plant as being very aggressive. Sometimes called jump-about, the species came to be considered a weed in England soon after it naturalized there in the sixteenth century.

After being introduced to the U.S., goutweed became established in much of the eastern half of the country southward to South Carolina. It can also be found in Tennessee, Kentucky, Ohio, Illinois, Indiana, Michigan, Montana, Idaho, Oregon, and Washington.

Description of Goutweed

This stout, smooth herbaceous species is typically a foot to 14 inches in height. The hollow, erect stems are grooved. In addition to the above ground stems, this species also bears creeping underground stems and creeping rootstocks that enable the plant to spread rather easily. Goutweed produces many leafy shoots.

Goutweed

The finely toothed, twice compound leaves consist of leaflets, 1½ to 3¼ inches in length. They can be oval, ovate, elliptic, or lance-like. The leaf stalks are clasping and winged, particularly the lower ones. The basal leaves feature long, expanded petioles, while the upper ones are borne on shorter petioles with segments that are up to three inches long.

Lacking bracts, the tiny goutweed blossoms begin emerging in Spring, typically late May, and continuing into mid-Summer. Usually white but occasionally yellow, these form compound, three inch wide umbels. Each umbel contains a dozen or more flowers. With 12 to 20 rays, these blooms are reliable sources of nectar and pollen.

The oval, smooth, seed-like fruit with flat sides is aromatic.

Growing Goutweed

I well realize that even including information on growing goutweed might likely be controversial. Nonetheless, in defense of this plant, the fact remains that it is less aggressive than truly invasive species, such as kudzu. It is more likely to spread in rich, moist situations.

In addition, I found it thrived in those difficult and troublesome spots in the landscape where more desirable species didn't survive. For example, it grew as a ground cover right along the foundation of my house, which was a dry, shady, inhospitable place for most bee plants.

Hardy to zone four, goutweed can serve as a ground cover or edging. Easy to grow, this adapts to most soil types. Though it seems to prefer partial shade, the plant is fairly tolerant of full sun. Goutweed is usually propagated by dividing the roots in Spring or Fall.

Goutweed can sometimes self sow and form large patches. To limit its spread, bee gardeners can remove the dried flower heads before the seeds mature.

The most widely grown goutweed is the variegated form that is commonly called silver edge goutweed. Adding a touch of color to shady sites, the plant features white along the leaf edges. It is much less likely to spread than the species. This cultivar is available from Well-Sweep Herb Farm.

Cumin (*Cuminum cyminum or odoratum)*

Originating in the Mediterranean region and Turkestan, this was introduced to Egypt in ancient times. It was one of the first herbs to be cultivated. Sometime after its introduction in America, cumin became naturalized in Texas. The genus name comes from the Greek word for the plant.

Description of Cumin

Cumin largely resembles fennel. Branched at the top, the slender stemmed, rather small annual is only six to eight inches in height and equally wide. Occasionally, it has been taller. All plant parts are smooth except for the fruits. The finely divided foliage consists of slender, thread-like segments that are very narrow and ½ to two inches in length.

The needle shaped blossoms begin emerging in June and July in few flowered, compound umbels. These are mostly white, but are

Cumin seeds.

Cumin

sometimes pink. The umbels appear rather sparse compared to those of most other carrot family members.

The flowers feature short rays and two inch long bracts. Bees and other pollinators work these blooms for nectar and pollen.

The narrow, bristly, scented fruits are 1/3 to ¼ inch long. These usually mature about four months or so from planting time. The stems tend to bend under the weight of the maturing fruits.

Growing Cumin

Easy to grow, this herb craves warmth and full sun. The seeds can be direct sown once the soil is warm and the danger of frost has past. Beekeepers in regions with short growing seasons can start these early indoors for this herb needs a long growing season for best results.

Germination is optimal when the soil is at least 70°F. Seeds sprout in about 10 to 14 days. Space cumin plants around one to two feet apart.

The herb prefers a light, rich, well drained, sandy loam. But, it is suited to most average garden soils. The preferred pH range is 4.5 to 8.2. Seeds are available from Richters and J.L Hudson.

History of Cumin

Grown since ancient times, this plant was widely used in Persian cooking. The Greeks also grew this species, and they were responsible for introducing it to the Romans. Becoming a staple spice in Rome, it was by far the most commonly used seasoning of the era. Cumin seeds were found in King Tut's tomb, which dates to 1323 B.C.

The earliest known cookbook to be published was called "*Apicius de re Coquinaria,*" and was attributed to Apicius, a Roman gastronome. It contained recipes featuring cumin. Cumin was also mentioned in an ancient Roman proverb that refers to a miser as a cumin splitter.

Cumin was featured in the writings of Dioscorides, a 1st century Greek physician, Theophrastus (371-287 B.C.), and Pliny the Elder (23-79 A.D.). In ancient times, people believed this could promote fertility. Sometimes, they used the burning plant to disinfect rooms.

This herb was mentioned in the Bible numerous times. Jesus referred to tithes, which at that time would actually have been paid using cumin seeds.

Cumin was one of the herbs appearing in the list of plants that were grown on the estates of Charlemagne (742-814 A.D.). This list is known as "*Capitulare villis Imperiabilis.*"

This herb became very popular in Britain during medieval times. Over the years it then gradually fell out of favor.

Harvesting and Using Cumin

For best results, harvest cumin fruits before the seeds are completely ripe. Otherwise, they can shatter. After collecting the seed heads, allow them to completely dry before storing them. Grind the seeds right before using them as this seasoning has a short shelf life.

Cumin seeds are added to liqueurs in Germany and France. In India, this show up in curries and tandoori. It is widely popular in Mexico where it is used in beans. The spice has gained popularity in the Middle East, Spain, and North Africa.

Ground cumin is added to chili powder and garam masala. This is also used to flavor couscous, pickles, sausage, bread, cheeses, rice, sauces for wild game, pork dishes, cakes, spicy drinks, and roasted chicken. The roasted seeds are added to yogurt, cucumber dishes, and lamb.

This plant has been used medicinally. The oil shows up in perfumes.

Coriander (*Coriandrum sativum)*

Coriander deserves a place in this series even though I covered cilantro as a green briefly some years ago. This species is reportedly native to southern Europe and the Mediterranean region. The plant has naturalized in many states with the exceptions being Idaho, Wyoming, Utah, Colorado, Kansas, Nebraska, Wisconsin, Minnesota, Iowa, Arkansas, Mississippi, Alabama, Georgia, Kentucky, Illinois, and from Vermont to Maine.

Description of Coriander

This strongly aromatic, smooth, slender herb with carrot-like roots has a much branched stem. It reaches one to four feet in height with a spread of one foot.

The vivid green foliage is two to three times pinnately divided. Initially, the new leaves are lobed and toothed, becoming more thread-like over time. While the stem leaves are generally linear and rather finely cut, the upper ones are broader. With irregularly toothed edges, the basal foliage ranges from ovate to wedge shaped.

Coriander

The very small, white to pink blossoms form compound umbels from June through September. The flowers contain very few rays, mostly three to eight. The blooms on the outer edges of the umbels bear oversized rays that resemble petals. The bracts surrounding the base of the flowers are thread-like.

Coriander fruits are borne in ribbed, green clusters that ripen to brown. They're ovoid to semi-globular. In warm climates, these will be larger than elsewhere, ½ inch long. Each fruit contains two brownish-yellow, sweet flavored, spherical seeds.

Coriander

Bee Value of Coriander

Bees are sure to visit coriander blossoms. They eagerly collect the pollen, which can be pink or red. The flowers are also a great source of nectar, which has a low concentration of sugar. Each bloom can bring 0.15 mg of nectar daily.

When enough of the plants are available, a good crop of honey can result with 400 to 1000 pounds per acre, depending on location. The dark colored honey has a wonderful flavor.

Growing Coriander for the Seeds

Coriander seeds are readily available from most seed catalogs. Slow bolting varieties aren't the best choices for bee gardens. This herb is suited to well drained, reasonably rich soils. Preferring light soils, the plant thrives in most adequately drained types. The optimal pH is 5.0 to 8.2.

The seeds sprout in one to two weeks. They're usually direct sown since coriander doesn't transplant well due to the long roots. They can be planted in the Spring or Fall, depending on the climate.

Plant in the Spring once the danger of frost has past. Sow the seeds ½ inch deep and one to 1½ feet apart. Bee gardeners can continue sowing a new crop every three to four weeks during the Spring to provide bee forage for the longest period. Those in warm climates can sow an additional crop in the Fall provided the plants will have sufficient time to bloom.

This crop is grown mostly in sun except in warm climates, where partial shade is best. Avoid adding excessive fertilizer when preparing the soil. Keep the area weeded, and water during dry periods.

As coriander plants begin to mature, staking is helpful since the stems can bend under the weight of the developing seeds.

Harvesting and Using Coriander Seeds

From sowing to seed harvest is about two to three months, depending on the variety and location. Seeds begin ripening as soon as the blossoms turn brown. Harvest while the seeds are still slightly green to prevent them from shattering.

Coriander seeds have a citrus-like flavor. They're used as a flavoring for apple butter, apple pie, cakes, breads, fish, pickles, marinades, chile sauces, sausage, curries, and alcoholic beverages.

History of Coriander

Coriander was among the earliest spices and herbs to be domesticated by the ancients. Seeds were uncovered in King Tut's tomb. The plant is mentioned in Egyptian writings from 1550 B. C., in the Bible, and in Sanskrit texts.

The seeds were used by the Greeks and Romans for culinary and medicinal purposes. The Romans introduced the plant to Britain. It remained popular there throughout the Elizabethan and medieval times.

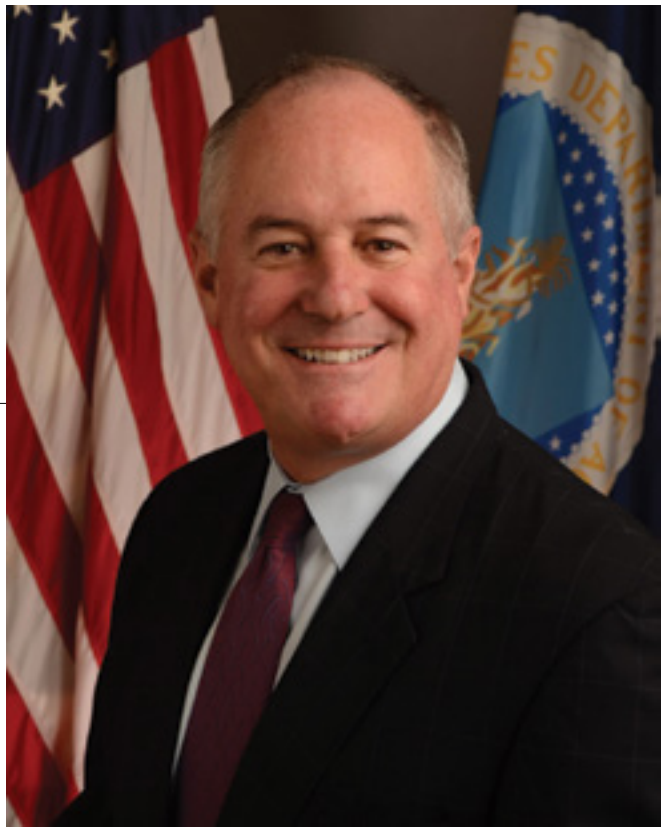
The Spanish brought the plant to Latin America. It arrived in Massachusetts during the Colonial times. BC

Connie Krochmal is a beekeeper and plant expert living in Kentucky.

Val Dolcini

Toni **Burnham**

President of the Pollinator Partnership



You could say that I was Val Dolcini's first supervisor at his new job. We needed volunteers to harvest honey from DC's Blue Plains wastewater treatment plant apiary with third graders from Maury Elementary. On May 30, 2017, some guy named Val raised his hand on our social media: "No experience required?" I said, "Oh, you'll get some."

And that's how ***Val Dolcini*** spent his first day as ***President of the Pollinator Partnership*** (**www.pollinator.org**). The Pollinator Partnership's (P2's) promotes the health of pollinators through conservation, education, and research. Val is a local community pillar, too: he serves on the DC Mayor's Office of Planning Food Policy Council, which works on healthy food access for all city residents.

For what it's worth, the local Fox News affiliate singled him out for an interview, not me, which just shows they know talent when they see it (even when I am clueless).

Beekeepers can find the Pollinator Partnership confusing, because it operates on several different levels, and it works with all pollinators, not just honey bees. Nonetheless, through its research grants to scientists (often young, inspiring ones); its tireless advocacy for pollinators to leaders across politics and business; its sponsorship of task forces which provide practical information and tools directly to us; and its annual North American Pollinator Protection Campaign (NAPPC) Conference gathering all of this together, P2 is doing several things that you want to know about, benefit from, or maybe participate in.

Val Dolcini became President of P2 after a long career in both in business and in government. He was formerly Administrator of the USDA Farm Service Administration! I spoke to him just before the 18th Annual NAPPPC Conference in October.

"This will be my second foray into the world of the NAPPC Conference: it brings people in from all around the country. Lots of general folks, including land managers and other regulators, but there is also a big contingent from land grant universities around the country. Other similar nonprofit organizations like the Monarch Joint Venture take part, as well."

"There's a lot of really good work that we do on a broad front of relationships. The NAPPC Conference is a good opportunity for that and it is fun for me as the non-scientist in the bunch, to learn more about things that are happening in the Midwest with Monarch butterfly issues, or urban settings. I was out talking with a scientist at San Francisco State who has done a lot of really interesting work around the bee populations in San Francisco. She's been able to fund the research of graduate students in Golden Gate Park and the Presidio and some of the other green spaces to develop a better inventory of the local bee and butterfly populations."

The first day is open to the public and includes presentations from scientists and leaders on issues ranging from P2-funded research to updates on beekeeping to projects on habitat restoration. Then the conference gets down to the work done on site.

"The work of the NAPPC Conference over the last 17 years – the October meeting was the 18th iteration of the conference – has been to focus on task forces which meet there, like 'urban agriculture' or 'native bees' or 'appropriate plants for your part of the world." One of the conference days is spent on task force meetings where groups work on their topics, then the following day they present that to the larger group. Each task force then gets charged [with its mission] for the coming year"

"What we have seen in the last year, for example, is a real interest on the part of renewable energy companies in siting honey bee hives on solar farms. Therefore, one of the task forces is going to be re-formed to focus on trends and developments there."

"We give out scholarships – essentially, they are grants – to young researchers who are focused on honey bee health-related issues. We're the conduit for USDA money to provide to young men and women around the

Val Dolcini hands replacement hive to hurricane-struck beekeeper in Puerto Rico.

country who are doing really great and interesting honey bee health-related research projects."

Many of those projects are part of the the first-day conference presentations!

Val continues, "USDA has been an important partner and funder and collaborator with the Pollinator Protection Campaign over the years. This year, the U.S. Forest Service is the primary host for the NAPPC Conference. EPA is another big partner of ours, while the Fish and Wildlife Service and the Department of the Interior, among other agencies, are really helpful."

"But there are all sorts of state and federal (especially federal) partnerships that P2 has been developing!"

"We just had a great call with the Department of Defense: they manage 25,000,000 acres at installations around the world! In a lot of those spaces, there are great opportunities for pollinator habitat. More and more, base commanders are interested in developing some of that habitat for the Monarch or for other species.

"[Our contacts] at DOD say that it is an installation by installation issue, so you might get a General or Commandant who is really interested in pollinator protection and promoting pollinator health on their site. But you will certainly find others who aren't focusing on that at all, and instead might be working on eradicating certain kinds of insects. The people with whom we are in conversation are saying that this is a good starting point."

Isn't all that really all about Monarchs and native bees, though?

Val Dolcini disagrees: "Since we are an organization which is agnostic when it comes to species (we're not focused just on the honey bee or just on the Monarch Butterfly or just on the Mexican Fruit Bat, we are really a group that seeks to protect all pollinators) that gives us a degree of credibility when it comes to getting into meetings or developing relationships with private companies or elements of the federal government or land grant universities or backyard gardeners."

Looking at these rather large organizations with which you are working, is there a channel through which the average beekeeper or local association can get involved and participate? Is there some way we'd have to organize?

"No, you don't really. I think based on my observation of what has been happening in DC and other places over the past year or so, for example, I think you all seem pretty well organized in many respects. You don't need any broader organization than to share in the mission of P2, which is to protect pollinators . . . to take advantage of our resources or the things that we do."

"I always urge folks to visit our web site at **www.pollinator.org**. That's where we have a whole long list of resources, whether it's Eco-Regional Planting Guides or links to topical research issues or information about school garden kits or access to any of the brochures that we print. All of that is downloadable and available for free to beekeepers who are interested in learning about issues that are relevant to their part of the world."

"The Eco-Regional Planting Guides are great tools, for example, because all you have to do is to plug in your zip code and come up with, say, the MidAtlantic Planting Guide. That's really valuable for backyard gardeners and not only beekeepers, but those who want to bring pollinators into their back yards. They figure out what works best, grows best in their part of the world, and that is a great start for folks before they invest possibly hundreds of dollars in plants that aren't suited to their space or to the pollinator population."

Would it be helpful to P2 if beekeepers and beekeeper organizations were proactive in reaching out to you?

"It probably would, and folks can certainly contact me at **vdolcini@pollinator.org**. *Bee Culture* has been generous in including the Pollinator Partnership in the magazine and working with colleagues in Ohio. The American Beekeeping Federation and the National Honey Board have shared newsletter space and helped us achieve a broader reach that we have today."

"All of the issues that we work on are important for hobbyists, for sideliner beekeepers and for the commercial outfits that are moving their bees all around the country. For the second or third time now, I think, pollinators have got provisions in the Farm Bill that include important first and second and third steps. [Pollinators are] never the issue, however, that is at the top of the list. That's why it is so important that organizations like mine and associations like yours and big national federations get together and collaborate on these types of things."

Where can beekeepers find out about the Farm Bill provisions?

"There aren't a lot of provisions, but the last administration did a lot of work around pollinator promotion, which created momentum as we get into another Farm Bill. Congress left town before passing another Farm Bill, and unfortunately those programs have lapsed. They will be resuscitated when they return and pass a new Bill."

"They are important: they create incentives for farmers to provide some habitat on their lands, it creates opportunities in the Conservation Reserve Program for farmers to use less productive land as habitat for pollinators."

Could right now still be an opportunity for beekeepers to reach out to their elected representatives about the

beekeeping in the Farm Bill? Programs that individual beekeepers would like to see? Does anyone know how many beekeepers there are and where they are in order to get attention?

"Unfortunately, we don't. We know that, according to USDA, beekeeping has been a declining part of our farming population over the past several decades. Obviously, the amount of commercial honey production in the United State has dropped dramatically."

"But I do believe that there are lots of other people who fly under that radar, backyard beekeepers or others who fall into the category of 'non-commercial.' When I was part of the Farm Services Administration, we had problems making our bee programs widely known because there wasn't a great way of identifying all of the potential folks out there who would benefit!"

"And we aren't talking here about people with 100,000 hives! These could be people with maybe 50 or 60 or even 100 colonies – folks who could still be eligible for programs like disaster relief and other things."

"I think beekeepers might like it that way, and are staying out of the spotlight intentionally to a degree. On the other hand, it would be nice to go to a member of congress and say 'Hey! You've got 45 or so active beekeepers in your district who are members of this association . . .' or maybe '*BeeCulture* is read by 4,600 voters in State X,' or something that quantifies those things a bit more."

[Hint] Wouldn't that be a great carrot to use to tempt people like magazine publishers and vendors to pool data!

Val thinks and says, "At Pollinator Partnership, we have been able to do things like look at the Mite-a-Thon numbers over the past couple of years, and that is just a small subset of people who are checking for mites. And it's one week out of 52. But still, it's 1,100 or 1,200 people who decided they would participate in this program and submit this data to the BeeInformed Partnership . . . It's a way to get a sense of where regional participation may be the highest."

And other numbers are coming in: "Participation in NAPPC and in Pollinator Week across the U.S. are convincing more folks to devote areas of their parks or school grounds to pollinators. I believe we will announce in another couple of months that we have met the goals of the Million Pollinator Garden Project, too. You know that's a million individuals, institutions, or organizations that devotes some part of their resources and landscape to pollinator habitat – the numbers are quite impressive when you begin to add them up like that."

You know, we urban beekeepers have a pretty big stake in understanding more about native pollinators, too: among the calls for "swarms" and bee trees and bees in structures people need lots of info about what is nesting in the ground or under the eaves or hanging from a tree branch. When we answer, we become a more valued community member and our own bees are more welcome!

"Much of the work that P2 does is to try to create relationships with local beekeeping associations but also a lot of our focus is on native pollinators and what we can do to support native bee populations. A lot of the work that we have done with private industry is there – whether it's the Ford Motor Company to develop a better sensibility around their pollinator programs or it's renewable energy companies that want to use their land not just for solar panels but for habitat. We are working with companies like Boeing to redevelop Superfund sites that have been brownfields but are being turned into pollinator prairies."

Critical replacement woodenware for Puerto Rican beekeepers in need.

"There's just never a shortage of really fascinating issues."

But it seems to me that P2 steps up with resources in times of crisis, too

"With the exception of the Honey Bee Health grants for the research projects that I mentioned earlier, P2 is not in a position to provide funds. There are limited exceptions: for example, our support for disaster relief in Puerto Rico."

"After last year's hurricanes, we were able to provide some seed money for local organizations, including beekeepers in the Virgin Islands, who were really grateful for help with emergency hives and more. "

"Puerto Rico went well. Since beekeepers are not always the first people to line up to submit a lot of paperwork and *more so* in the islands, it was harder to identify the people to whom we wanted to provide assistance. There is a great bee lab at the University of Puerto Rico San Juan, though, with which we forged a good relationship. We were able to connect with seed companies that do research on the part of the island. We were also able to reach out through the Florida Beekeepers Association to beekeepers like those in the Virgin Islands."

"They have a different set of challenges in the Caribbean, to be sure. The nice way to describe the operations they have may be "rustic," after being walloped by two hurricanes in three to four weeks. They had a lot to recover from."

Were replacement hives made available in Puerto Rico as well?

"Absolutely! Replacement hives as well as food for the bees such as pollen patties and powdered protein were made available through the generous donations of organizations like Mann Lake and Dadant and Brushy

Val with Virgin Island beekeepers, after hurricane. Destroyed and patched bee colony.

Mountain and others. A lot of citizens, too! We had a GoFundMe page that raised close to $20,000 and another $50-60,000 that came in the form of in-kind donations or other contributions. We were able to make a real difference."

Would it make sense for beekeeping associations with local research ideas to approach P2, or perhaps the NAPPC task forces, for involvement with these ideas? For guidance? For consultations? For pointers to advice or providers?

"Yes, yes, yes and maybe! All of those are things that P2 has done historically and is doing today and will presumably continue to do in the future. We have been consultants to local groups that are putting together habitat plans, we've provided resources to organizations that have been working on redeveloping a plot of land. Frankly, these things are often not huge. We've done work in Ohio on small parcels, but even a small parcel can host a pretty thriving population of bees and butterflies!"

"Once they've been a place for a few seasons, the natives have out completed the local weeds and other invasives. Then you've got a wonderful, biodiverse collection of species that includes pollinators to be sure, but they also include beneficial insects, and depending on the habitat maybe small mammals and other things that now call that home."

I can personally attest to the help to local beekeepers that Val has given, including his own time (not all spent hand-cranking an extractor with nine-year-olds), talks to our club and to community groups, access to information and decision makers, and endless patience with me. There are projects we dream of here that we would not have considered without him. He's a gem: reach out and see for yourself. BC

P2-LED RESCUE CAMPAIGN AIDS CARRIBEAN BEEKEEPERS

One year ago, deadly hurricanes struck the Caribbean, causing beekeepers devastating losses. Most wooden hives were destroyed, with no replacements available. Bees that survived swarmed, taking up residence in people's homes, schools, and other structure. Flowering plants were stripped from the islands, surviving bees were starving. Beekeepers had no access to supplemental protein sources.

The Pollinator Partnership (P2) quickly responded to desperate appeals for help, launching a rescue campaign to provide emergency assistance to beekeepers on Puerto Rico, the U.S. Virgin Islands (USVI) and neighboring islands. Fellow beekeepers and private citizens from throughout the United States, industry groups, companies, and non-profit groups responded, generously donating funds, products and transportation.

Action was taken on an expedited basis to ship and distribute thousands of pounds of supplementals to help keep bees alive until plants recover. The campaign then provided replacement hives and other assistance: almost 1,000 were shipped to Puerto Rico and assembled by volunteers and distributed to beekeepers, with some then forwarded to Dominica. 250+ hives went to beekeepers on the USVI and British Virgin Islands. The campaign also donated scientific equipment to the University of Puerto Rico to support critical research.

Caribbean beekeepers are essential to local agriculture, providing pollination services to specialty crop farmers. They also contribute to the economy through the sale of honey and other products. With the caring help of many, the P2-led campaign helped them at a critical time as they continue working hard to recover.

While there are many individuals whose selfless contributions of time and expertise deserve recognition, there are three in particular

- **Tony Hogg**, former president of Florida Beekeepers, who is also a marine harbor pilot at the port of Jacksonville, not only rallied fellow beekeepers in Florida to help but provided invaluable expertise by helping P2 navigate the complexities of ocean shipping to the islands.
- **Professor Tugrul Giray**, chairman of the biology department at the University of Puerto Rico, provided essential leadership through his already established relationships with beekeepers on the island, ensuring that relief supplies were distributed to beekeepers in need. He is continuing to help beekeepers on the island work for a more sustainable future through queen rearing courses and research.
- **Toni Downs**, beekeeper on St. Croix, took the lead in organizing beekeepers and other volunteers on the USVI, identifying needs and then ensuring assembly and distribution of hives once received on the USVI and BVI.

Cash donations and in-kind donations of products and services totaled about $110,000. Local beekeepers and other volunteers on the islands (scout groups, etc.) leveraged these contributions by packaging and distributing protein, assembling hives, etc.

Beeyard Thoughts, Observations, and Updates

10 Good Ways To Have A BAD Bee Meeting

Memorable meetings – Good and Bad

At one time, we have all been to a good beekeeping meeting. What was it that made the event a good meeting? What kind of meeting was it – a local county meeting, a field day, an annual state meeting or a workshop? For a lot of years now, I have had responsibility for both organizing meetings and participating in meetings. Many of you have, too. You and I know the meeting situation as both organizer and speaker.

Even so, I still can't tell you exactly what it takes to guarantee a good session. However, let me ***reverse*** my thoughts here. Let me discuss a few major points that help you conduct a *bad meeting*, because unfortunately, bad meetings are as memorable as good meetings.

1. Do not advertise the meeting in advance.

Leave advertising and promotion to the last minute. In this way, people will either (a) never learn of the meeting until after it's over or (b) will have already made other plans. Organizers who are planning a diversified state meetings may start advertising the date and the location of the meeting – even if the program is not completely set, about four to six months before the meeting date. Usually, getting the word out with a finalized program and meeting location about four to six weeks before the meeting is appropriate. Get the word out too early, (unless the meeting organizer has frequent follow-up notices) and people will forget and still not show up.

2. Have the meeting on a day that you have really bad weather.

What can anyone do about the weather? That's exactly my point. Not much can be done about the weather, so plan accordingly. How close is the parking lot to the meeting site? Are people going to be drenched from rain getting into the meeting. (Remember that many beekeepers are not young people). Will snow removal be adequate?

In hot climates, is the building air conditioned? If outdoor events are arranged, what are the *"doomsday plans"* in case of bad weather? I recommend a complete auxiliary program that you could quickly change to in case of bad weather. You can't control the weather so you have to change the program. Be prepared.

Great crowd, great room, great PA system and two very small projection screens.

3. Begin the meeting late and stay behind schedule all day.

This point has a kicker in that starting late pretty much makes your written program useless. It also squeezes the speakers who are presenting just before lunch, thereby making them readjust their presentation which just causes more confusion and threatens the quality of their presentation.

The program organizer should not become a drill sergeant, but should be firm. Confidently and loudly entice people to take their seats so, *"we can start the meeting!"* Most people will do as you ask while a few will stand around and talk regardless of your requests. Gently move the talkers out into the hall and close the door. Remember most people come to bee meetings for socialization as much as education. Unless there are people still standing in the registration line, traffic jams, or some other extreme excuse, start the meeting on time. Fight the urge to *"wait just a few minutes more."*

4. Have everything in the same room.

This includes the registration table, the program, the exhibitors, and the break area. By having everything in one room, you assure general chaos and constant background noise. People will be steadily moving around and talking to others while the speakers are presenting. The speakers will either be distracted or will speak louder through the public address system – either of which will contribute to a low-quality, noisy meeting. Keep this point in mind when searching for meeting sites.

5. Be negative and pessimistic during opening remarks and then maintain that attitude throughout the day.

I have always loved this one – *Jim Tew is our speaker today. We had hoped for a larger crowd, but I suppose many beekeepers had something*

Great teaching apiary, great colonies, long hot walk for older beekeepers.

Beautiful set up, beautiful day, great crowd, PowerPoint unusable.

else to do. As a speaker, I now feel flat and disappointing while the audience wonders if they are shirking duties somewhere else.

Many years ago, during the early *Varroa* years, I sat dumbfounded while a disheartened club president, during his opening remarks said, *"Just look at this small crowd – What have we come to? I can remember just a few years ago when we had four times this many participants – I just don't know what's to become of our group – Well, our first speaker (sigh) this morning will be Dr. Jim Tew . . .*

As first speaker up, I either must deal with a shamed audience or I can embarrass the president by trying to mitigate his remarks. Either way, everyone loses. The people who are at the meeting are where you want them to be. They need your leadership and encouragement – not derision.

In another situation, a long-time cherished member of the club had passed away the day before the meeting. Most members were unaware of the loss. Just before the first speaker began, there was a respectful moment of reflection and silence. Participants were shocked and hurt. None of these procedures were incorrect, in fact they were admirable and showed respect for a member lost, but the first speaker was dead in the water and the remainder of the meeting was gloomy.

In this case, there was a serious loss of a friend to the club and the meeting should have been expected to have had somber overtones. Surprisingly, all *memorable* meetings (as compared to *good* meetings) don't have to be bright and cheerful to be ranked as successful or worthy.

6. Cancel the break.

"Well, since we are running behind time, I think we will just cancel the break." You've heard that one before, haven't you? Human behavioral studies indicate that an average person can take about 15 minutes of directed concentration before taking some form of a break – even if it's mental. The average talk is 30-45 minutes long. People are going to break one way or the other. Even if one is so stimulated as to be mentally receptive beyond 15 minutes, people need restrooms, food, to phone the kids, to feed the meter – or just to simply stand up for a bit.

Canceling the break also means that Point #3 has probably already been implemented (the meeting is behind schedule). Also important, the participants need to have something to break to. Have something there. Cheap cookies, watered-down fruit drink, or home-baked goodies, but have something there for social interaction. Eating is a very social thing for humans and to have a munchless break flies in the face of quirky human social behavior.

7. Jerk your speakers around.

From my perspective as a speaker, one of the surprise events that used to bother me most was to get to a meeting and read in the official program that my topic is not what I was expecting. I've had to learn to live with that in this manner – After getting behind the podium (or whatever), I speak for a few minutes on the new topic and then make some lame connecting statement and give the talk that I am prepared to give. I really have no other choice.

Besides topic changes, having your speakers make limp, braindead conversation while someone (I hope) looks for light switches, projector power cords, ways to lower the screen, or whatever else that's wrong. These are always disruptive moves. Two simple, but dreaded questions that speakers must contend with are, *"Could I have the lights down, please?"* and *"Could I have the first slide please?"*[1] If the speaker can briskly get through those two requests, the entire demeanor of the presentation is more positive.

7a. Conversely, let your speakers jerk you around.

Most speakers have problems – not filling their allocated time – but staying within their allocated time. In my opinion, several things are happening when a speaker goes beyond the allotted time. First, all speakers want to be *"worth the money"* (you are paying them, right?). There is a simple tendency to keep talking just to be sure that your talk has been all that it should be.

Secondly, if people are truly supportive of what's been said and are eagerly asking questions, then the speaker tends to justify going over time *(by apparent popular demand).* A professional speaker will stay within the allotted time, will leave time for questions, and will sit down.

What do you do if the speaker doesn't stop? In my opinion this is one of the most difficult situations a meeting organizer must deal with. How do you publicly, politely ask someone to sit down? There is no easy answer. I have frequently asked speakers, in advance, to acknowledge the clock and then made sure that a clock was plainly visible. Only the harshest scientific forum will bluntly ask a presenter to sit down – immediately.

To avoid the drill-sergeant-look referred to earlier, you have to give a few minutes of "overage." Once that

[1]You might be surprised to learn that many facilities require that another person advance the PowerPoint slides. It is a bit clumsy, but it certainly works.

Great teaching moment, great presenter, needed a portable PA system for people standing behind the presenter.

Teachable moment, great room, good blend of products, crowded during break times.

wobble time is gone, something must be done. The time-honored procedure for getting a speaker to shut down (or shut up as the case may be) is to: (1) Begin pacing in the back of the room as time runs out, (2) Move pacing to the front of the room, (3) Eliminate pacing, but position yourself at the speaker's elbow and finally, (4) If all else has failed, either written or verbally (in his/her ear) ask them to end it. I have never had a speaker go beyond #4. If it happens, I guess call the police, but I doubt It will ever be a problem to that extent *(Note: I'm joking).*

8. Schedule topics that are beyond either the scope or interest of most of the participants.

At most state and local meetings, the majority of the people attending want to hear discussions on practical aspects of beekeeping. In fact, after a few years, they should be repeated for reinforcement. Topics such as recognizing American Foulbrood, preventing swarming, anything to do with mite control, anything on queen management, honey production, or finding yard locations are topics that are routine at a bee meeting. This list is far from inclusive, but does show that highly technical presentations are frequently not well received by a non-technical audience. No matter what the program presents, rest assured that you will not please everyone. Keep the level of the program topics and the audience interest level compatible.

9. Don't have printed programs, handouts, equipment catalogs, exhibits or displays, and certainly don't give away door prizes.

This suggestion is primarily for larger, regional meetings. Local meetings can be much more casual. Not having the items listed is a great way to make the meeting look *"thrown together."* If they are not given handouts or leaflets, participants are only able to use what they can recall from memory. Without catalogs or door prizes, they will not get a chance to review equipment in current use. The greatest of all however, is not having a printed program. In this way, no one ever knows if the program is on schedule or not. No way to lose. Participants won't know if they are at a bad meeting.

10. As a participant, complain as often as you can – before, during, and after the meeting.

I can't think of any officers of state or local organizations who are paid for their services. Everyone is a volunteer. Even if they are not doing a good job, at least they are doing something. People have varying amounts of time they can commit, plus people have different levels of ability. Working to hold the perfect meeting is always a goal – a dream – but is not always a reality.

The range of complaints can be exceptionally broad. The meeting room is too hot, too cold, too small, or too large, I can't hear, I couldn't see the screen, the break food was no better than military field rations, he talked too long, she didn't know what she was talking about, I didn't learn anything. There were too many travelogues, I didn't get the newsletter, I got the newsletter too late, those chairs are so hard, registration costs too much . . .

Complaints never end. But they do burn out even the best officers. Keep in mind that no matter how bad a meeting may be - at least it's a meeting and it can be improved in the future.

In a world where every meeting is beautiful . . .

Having the perfect meeting is much like finding the perfect beeyard – it just doesn't happen as often as we would like. Some meetings are excellent while others are truly uninspiring. Even well-planned sessions can go bad for reasons too numerous to list. It happens. Don't give up.

As a participant, be as patient as possible and as a meeting officer, be as prepared as possible. Without opportunities to train new beekeepers or distribute information to established beekeepers, our beekeeping industry will not function as an industry. Take the good with the bad and work for the best. BC

Readers, let's write an article together…

I would like you and me to write an article on Small Hive Beetle (SHB) affects and control possibilities. Ideally, those who have had their bees and bee operations upset by SHB would write me their experiences and their control procedures – anything – what kind of beetle traps works best for you – how often do beetle attacks occur. My effort would be to gather some of your beard beetle events and compile these experiences and procedures into a general SHB review with some possible (and legal) individual beekeeper solutions for beetle control. Include photos if possible. I can only give you four weeks to respond. If you miss that date, send your thoughts anyway. There may be an update in the future. Send to: tewbee2@gmail.com

Dr. James E. Tew, State Specialist, Beekeeping, The Alabama Cooperative Extension System, Auburn Univ, Emeritus Faculty, Entomology, The Ohio State University; **Tewbee2@gmail.com**

. . . Five, Four, Three, Two, One – Happy New Year

No matter where you live, or what calendar you use, there is something special about celebrating the Gregorian's calendar's passage from the "old" year to the "new" one. Parties, or gathering with old friends, can occupy two days – the EVE, now approaching being called "last year" and the new DAY ("this year").

Customs vary throughout the world, as do the traditional foods. In Asia the food should feature long noodles; in Spain and Mexico people will eat 12 grapes, individually, as the clock strikes midnight; in the Philippines round fruits (like an orange) are served; in Greece lamb and pork are on the menu. In the Middle East the featured fruit is the pomegranate. In Australia it's steak on the barbecue and a trip to the beach (it's Summer there, remember?). Austria serves a red wine punch but there seem to be various recipes for it. Lentils, beans and black-eyed peas are on the menu in India, Italy, Canada and in the United States. Glasses of Champagne will clink together at midnight not only in America but also in Germany, France and the Netherlands.

Can honey have a role in our celebrations? Certainly! If you are celebrating with beekeeper friends you might consider a sparkling mead in a Champagne-style glass to clink at midnight. Some traditional foods that do not use sugar in their recipes probably would not benefit from honey. Just keep the traditional recipes but try some drinks, nibbles, main dishes and desserts that include honey.

Although eggnog is a traditional holiday drink at parties, those who make it probably have family recipes handed down for generations. In that case, stay with the traditional ones. But you can try this one from *The Honey Kitchen*, edited by Dadant & Sons.

EGGNOG
4 egg yolks
¼ cup honey
2 cups milk
1 cup light cream
1 teaspoon vanilla
nutmeg

Beat egg yolks until thick. Add honey and mix well. Combine milk and cream. Add to honey mixture gradually, beating after each addition. Add vanilla. Serve sprinkled with nutmeg. Makes 1 quart.

HONEY BERRY ROYALE
¼ cup honey
15 raspberries
3 ounces fresh lime juice
9 ounces crème de cassis
24 ounces sparkling wine

Set aside six raspberries and mash the rest. In a bowl mix the whole raspberries and the mashed ones. Add honey. Stir gently until all the berries are coated. Refrigerate for at least two hours. To make the cocktail, place all the ingredients except the six whole raspberries and the sparkling wine in a shaker. Add ice. Shake for 15 seconds. Strain into a champagne flute, add four ounces sparkling wine and top with a whole raspberry. Serves six.

You can join the Austrians with one of these two red wine punches, depending on how many you need to serve.

VINEYARD PITCHER PUNCH
750 milliliters red wine
2 cups apple juice
½ cup honey
1 cup whole strawberries
one lime cut in ¼ inch slices
11 ounces ginger ale or lemon-lime soda
ice cubes

Mix wine, apple juice and honey in large pitcher. Add lime slices and strawberries. Chill one hour or longer. Just before serving, add ginger ale and pour over ice cubes in tall glasses. Garnish each glass with some of the fruit. Makes 10 servings.

If the weather is cold you can serve a hot punch made with red wine. It's for a large party.

RED WINE PUNCH
4 cups strongly brewed black tea
1 cup honey, to taste
juice of 4 lemons
juice of 3 oranges
8 cloves
1 cinnamon stick
2 (750 ml) bottles red wine (choose a full-bodied variety such as Cabernet Sauvignon, Zinfandel, Pinot Noir or Merlot
fresh lemon and orange slices to garnish

In a large pot, combine the honey, the freshly brewed and still hot tea. Add the lemon juice, orange juice, cloves and cinnamon stick. Stir to combine. Add the red wine. Heat and stir over medium low heat until just below the boiling point. Gently heat the rum in a small pot (do not boil). Once hot, add to the larger pot and mix well. Remove cloves and cinnamon stick. Ladle into mugs. Serve hot with a fresh lemon or orange slice. Serves 12 – 14

Since pork is one of the New Year's favored meats, you can serve this festive version of a pork tenderloin.

PROSCIUTTO WRAPPED PORK TENDERLOIN WITH HONEY POACHED PEARS AND GORGONZOLA
1 firm pear
½ cup water
¼ cup dry white wine
4 tablespoons honey, divided
two 1-pound pork tenderloins
6 ounces crumbled gorgonzola
¼ cup chopped walnuts
¼ cup Italian seasoned bread crumbs
6 ounces prosciutto

Peel pear and slice into six wedges; remove core. In medium saucepan, bring water and wine and three tablespoons honey to a boil; reduce to simmer and add pears. Cover and cook 15 minutes or until pears are soft. Using a slotted spoon, transfer pears to a cutting board. Let cool then cut into medium slices. Preheat oven to 350°F. Slice a pork tenderloin lengthwise three-fourths of the way through. Open like a book. Cover with plastic wrap and flatten with a mallet to ½ inch thickness. Remove plastic wrap and sprinkle pork with pepper.

Place five 10-inch pieces of kitchen twine side-by-side on a foil-lined baking sheet. Place prosciutto, slightly overlapping slices, crosswise on top of twine. Place pork on top and spread with half of the pears, gorgonzola, walnuts and bread crumbs. Roll pork into a cylinder, tying to seal in the filling inside. Repeat with remaining tenderloin.

Roast pork 15 minutes. Spread with remaining honey and continue to roast until a thermometer registers 140-145°F, 15 to 20 minutes longer. Remove from oven and transfer to cutting board. Let stand 10-15 minutes. To serve, cut into ½-inch thick slices. Makes six servings.

Cornbread is on the New Year's menu in many places. This recipe uses honey, of course.

HONEY CORNBREAD

1 cup **each** yellow cornmeal and all-purpose flour
2 teaspoons baking powder
1 teaspoon **each** baking soda and salt
1 cup milk
¼ cup honey
1 egg
2 tablespoons vegetable oil

In large bowl, combine cornmeal, flour, baking powder, baking soda and salt. In small bowl, whisk together milk, honey, egg and oil. Add to flour mixture; stir until just combined. Pour batter into a well-greased 8X8-inch baking pan. Bake at 350°F for 25 to 30 minutes or until a toothpick inserted near center comes out clean. Serve warm. Makes nine servings.

While everyone is waiting for the clock to strike or New York's ball to drop, have some cheese and crackers handy for nibbling.

From all of us at Bee Culture*, A Toast For A Happy, Honey New Year!* (photo by Adam Garrison).

HONEY AND NUT GLAZED BRIE

¼ cup honey
1 tablespoon brandy
¼ cup coarsely chopped pecans
one eight-ounce wheel of Brie cheese (about five-inch diameter)

In a small bowl, combine honey, pecans and brandy. Place cheese on a large ovenproof platter or nine-inch pie plate. Bake in preheated 500°F oven four to five minutes or until cheese softens. Drizzle honey mixture over top of cheese. Bake two to three minutes longer or until topping is thoroughly heated. **Do not melt cheese.**

All recipes, except eggnog, from National Honey Board.

Are you having a party this year and inviting friends, old and new? Then as each guest leaves, present them with a container of your honey "to start the New Year off right!" Attach a hang tag with some colorful ribbon. Hang tags with recipes are available from the National Honey Board.

May your bees stay healthy and your honey supers be full in 2019! Happy New Year! BC

Ann Harman will be celebrating the New Year, safe and warm from her home in Flint Hill, Virginia.

BIGGER PICTURE

Jessica **Louque**

Bear Recipes To Die For

Overall, I'd have to say that 2018 was a pretty stressful year for our family. We *attempted* to build a house and move into it, but it was initially built too short for the foundation and after some run-ins with county inspectors and hurricanes and every other problem possible, the initial August move-in date turned into "maybe by Christmas" and was a source of constant anxiety. We couldn't get water or electricity at the new house, and our rental didn't have space for birds, so predators picked off all the guineas, turkeys, chickens, and ducks one by one until there was just a handful of chickens left at the old house. Strays are a lot more common out here and we ended up with three kittens by the end of the Summer, and I freaking hate cats. It turns out I don't hate them enough to leave them in the road when somebody throws them out of a moving car though. They were so ugly I couldn't get anybody to take them and now we have a very confused dog and five cats. The flea problem that exploded from these strays was epic and I felt like we were in a massive war for months trying to de-flea everyone and nearly killed one of the kittens with a "safe" flea treatment. Then, there's always the typical work and family stress, Henry leaving for college, moving the kids to a new school district, and our first full field season. In the midst of all of this, we learned that we are actually sharing our property with some not so pleasant neighbors.

We've had bees off and on at the Wolfpack Farm (Go Pack!) with varying degrees of success. Putting them near the pond gives access to nearly unlimited tulip poplar, locust, and sourwood, but the microclimate from the pond doesn't make for healthy or happy bees. We had vandals one year wipe out 79 hives when we put them at the top. This year, we put them at the very back of the property, about 3/4 mile off the road (200 yards behind our new house). They kept falling off the stands, and we thought we must have done something wrong. Then, we saw bite marks in some frames and some of the bottom boards ripped open. Bobby set up a trail cam, and we must be so lucky because we have at least two bears coming for our bees!

One of our new friends looks like it might be a yearling cub or so. The other one was able to stand up on his hind legs and put the trail cam in his mouth to investigate. I would expect that the big one is who took one of the hives and drug it all the way in the woods and disassembled it on the way down to the creek. I was able to salvage one of the hives and found the queen on the ground, and then one of them came back that night and finished off the colony. We had sat out waiting to see if they came back but they waited a lot longer than we wanted to in the dark.

It seems that a lot of people are not too keen on the idea of killing bears, even if they are a nuisance. North Carolina has a very large program in place to increase the black bear population and discourage aggression towards bears. We do have a hunting season ranging from November 17 – January 1, but you are only allowed to kill one bear, and it cannot be a cub or a mama bear with cubs. The North Carolina Wildlife Commission has some very interesting advice on dealing with bears, and all of it revolves around avoidance. There is even a specific section on their website regarding honey bee hives. Their advice is to keep hives away from tree lines and bear cover and put up electric fences that will discourage bears from reaching the hives. It also says to bait the fence so the bear receives a muzzle shock and learns to avoid the fenced area. According to the state map provided on the info page, the county that we currently reside in does not even have black bear populations. This is pretty insane because we've had bears as long as I can remember, but not particularly frequently.

Black bears are the only bears on the east coast, and North Carolina has had a program in place for several years to increase the population. They can range anywhere from 100-700 pounds, but the world record holder is from Craven County in North Carolina and weighed 880 pounds. They can keep their bears – I don't need any that big. Bears start to work on hibernation in Autumn and can eat around 20,000 calories a day to gain weight. It sounds like a typical Thanksgiving Day, right? This is compared to a normal diet of 3,000-8,000 calories a day in the rest of the season. It looks like our bears were trying to add to this massive calorie consumption with honey and larvae, and they did a good job since they took out 14 hives.

In our case, there is a good

chance that at least one of these bears will end up on the dinner table as recompense for our lost hives. With that in mind, I'd like to give you some tips in the event that you ever get to eat bear meat, you don't get sick. Always remember that wild game is nothing like farm raised meat and it will never taste the same, but may also provide more concerns. Black bear meat can be a carrier of *Trichinella spiralis* and *Toxoplasma gondii*, the parasites that cause the diseases trichinosis and toxoplasmosis in humans. Treat bear meat like you would chicken as far as not getting food poisoning. Cooking bear meat is like cooking pork meat. It should be cooked at 375°F for 20-25 minutes per pound of meat. The internal temperature should be 160 degrees for at least three minutes before you eat it to make sure all of the parasites are dead. There shouldn't be pink meat or fluid, or the parasites might still be alive. I know a lot of people love some nearly raw meat, but this is not the time to experiment with disease contraction. Cooking meat that has already been frozen doesn't make it safer either because cold does not always kill parasites.

Bear meat can be tricky to work with when you're butchering it too. It will likely have two layers of fat between you and the red meat. It shouldn't go to waste though – make your own lard or cook with the fat! Again, it won't taste the same as your standard bacon grease, so don't expect it to. If you wanted to make lard out of your fat, for a pie crust (as an example), you can put all the fat into a crock pot and cover it with cold water. Once it boils, reduce it to a simmer for four to five hours and skim off any impurities that should come to the top. Simmer it until all the water evaporates and the fat is rendered, but don't burn it.

If you have your lard, now you can make your pie crust. This works well for both savory and sweet pies. If you've made your own pie crust before, this is a fairly standard rendition of a pie crust recipe. It takes one cup of chilled bear fat, and make SURE! it is chilled. Then you'll need three cups of sifted flour, and one teaspoon of salt that can be sifted in with the flour, and a half cup of cold milk. Use a pastry cutter to cut half of the bear fat into the flour until it looks like cornmeal. Then add the remaining bear fat until the mixture is crumbly, and add the milk with a fork until everything is homogenous. If you can squeeze it in your hand and it stays together, you're good. If not, add another tablespoon of milk until it will bind. Wrap up your dough in plastic wrap and put it in the fridge for at least half an hour before you use it to make a pie crust.

As a shout out to Bobby and his Louisiana roots, I have a pretty good recipe for bear gumbo that we hopefully will get to try this year if we kill a bear. It starts the process by making bratwurst-style sausage. It takes about 10 feet of medium sized hog casings, three pounds of ground bear meat, three pounds of ground pork meat, two tablespoons of pickling salt, two tablespoons of dried parsley, one tablespoon of crushed red pepper flakes, one tablespoon of dried onion flakes, two teaspoons of garlic powder, and one teaspoon of black pepper. Mix the meat together in a large bowl and mix the seasoning together in another bowl. Alternate seasonings can obviously be used based on personal preference. Add the seasoning mixture to the meat and mix until it's evenly distributed. Cover it in plastic wrap and refrigerate it until you're ready to stuff the casings. Tie the casings off in 6" links, and age them for at least two days in the refrigerator. You can cook it the same as pork sausage.

Now you can use the sausage to make your gumbo instead of Andouille sausage. You'll need at least one sausage (more if you like it meaty), two tablespoons of butter, one cup of sliced green onions, one cup of green bell pepper that's seeded and chopped, a half cup of chopped parsley, two garlic cloves minced, a half teaspoon of dried thyme leaves, a half teaspoon of dried oregano, a half teaspoon of dried basil, a quarter teaspoon of cayenne pepper, a bay leaf, a teaspoon of Worcestershire sauce, 16 ounces of okra (I hate okra and do not use this), a can (16 oz) of stewed tomatoes, a can (15-16 oz) of tomato sauce, and a can (10 oz) of chicken broth. Cook the sausages until they turn brown. You can wipe this pot out after the sausage is done and use it again if you want. Melt the butter and add onions, green bell pepper, parsley, and garlic. After it's tender, add the other ingredients and bring it to a boil. Reduce the heat and simmer for 15-20 minutes. (This is supposed to be until the okra is tender, but okra is gross no matter what so I don't know how that's supposed to help in these directions.) Don't forget to take the bay leaf out and then you can pour it over white rice.

If anybody gets a chance to make bear gumbo, make sure you take Kim some to try out and see what he thinks! BC

NUCS

Good For Beekeepers, But Buyer Beware!

Winter is the time of year when beekeepers are making plans for next season and dream of making nucleus colonies (nucs) from their Winter survivors. Newbies are placing their nucleus colony orders for Spring pick up or delivery. Being less abundant than packages of bees, it is best to place nucleus colony orders early before they are sold out.

What is a Nuc?

Nucs are a great way to get a colony started. There is no need to introduce the queen as she is included. Nucs come with all the elements of a full-size colony, a fertile laying queen, worker bees, drawn comb, food and brood all in smaller amounts than that found in a full-size hive. As such, the nucleus colony will expand faster into a full-size colony than a package of bees, once installed on permanent equipment. Nucleus colonies are used to replace lost hives, increase colony numbers in an apiary, and sometimes used as back up in case more established colonies need bees, brood, food or a new queen. Nucs can also be created in order to stop overcrowding and possible swarming in larger more populous hives by splitting some of the bee population off into the nucleus colony. Some backyard beekeepers are finding that nucleus colonies are a great way to control swarming, make nucs to sell, and increase their own colonies.

Most nucs, it seems, come in only one size – deep. If you need mediums you may have to search a bit more for a supplier, or resize or replace the frames to fit your equipment.

What does a nuc contain?

There is no official standard for a nucleus colony and they can come with anywhere from three to 10 frames of bees, worker brood, honey and pollen often in a small box. However, the most common size is a five-frame nuc. Most nucs are also made up of deep frames; but some suppliers sell nucs on medium frames. Medium frame nucs will contain about half the bees, brood, honey and pollen as a nuc made from deep frames and should be priced accordingly. Some nucs even come on top bar frames as a result of increased demand by the growing number of today's top bar beekeepers.

Most nucs are sold in disposable cardboard boxes. Other suppliers sell nucs in wooden boxes. When sold in wooden boxes, nucs come with an enclosed bottom board and a screen stapled to the top in order to provide plenty of ventilation. Nuc suppliers that sell their bees in wooden boxes will sometimes charge a deposit on the equipment and accept the woodenware back in return for a refund of the deposit. Still others may require folks to bring their own bottom boards, covers, or even hive bodies when they come to pick up their bees. One drawback of getting a nuc from a supplier that requires the buyer to bring their own equipment is that many of the nucs foragers will be left behind during the process of transferring the nuc into your equipment. Ideally all nucs should be closed up for transport either early in the morning before the bees start flying, or late in the evening after all the bees are back in the hive. While most nuc suppliers require their customers to pick up their orders, sometimes suppliers will ship nucs through the mail, or even deliver the bees right to your apiary, especially if the order is large.

Identifying a poor quality nuc

Because there is no standard for a nucleus colony, some suppliers will push the boundaries on what constitutes a quality nuc. One all-to-common practice is to sell nucs that contain one or more frames of foundation that is not drawn out. Frames of foundation in a nuc are simply filler and a five-frame nuc that comes with a frame of foundation for example, should really be considered a four-frame nuc and priced accordingly.

All nucs should also come with a fertile, laying queen. It is expected that such a queen will be in her first year and up to about one year old (if the nuc has been overwintered prior to sale). Queens that are drone layers, or missing altogether should be replaced by the supplier.

If your nuc does not come with enough honey or pollen it pays to ask the supplier to exchange frames for one that does. The same goes for nucs that do not have enough bees to cover the frames. Nucleus colonies are extremely vulnerable to begin with since in some cases they will contain only about 10-15 percent of the worker bee population of a full-

size hive. The hive entrance of all nucs should be reduced once they are transferred into their permanent home.

The Quality Nuc

A high quality nucleus colony should resemble a strong hive but in miniature. The combs should all be well drawn out and mostly full of brood or food. Bees should fill the box and cover all the combs. The queen should be fertile and the brood nest should have both capped and uncapped brood and unhatched eggs. All frames and any woodenware that comes with the nuc should be well constructed and in good shape. You should not notice signs of disease, or varroa mites and small hive beetles when inspecting the colony.

Problem nucs (means problem bee suppliers)

Although nucleus colonies are initially more expensive than packages, their potential financial return by within the first year can more than make up for the increased purchase price. The biggest disadvantage in purchasing a nuc is the potential for disease transmission. Even if colonies don't exhibit any symptoms of disease, combs typically harbor pathogens and pesticide residues and the older the comb, the greater the potential for problems.

In some states inspection and certification of nucs by the state apiary inspector prior to sale is required. Depending on how they were handled before they are sold, diseases may be found in nucs, or occur among some nucs shortly after they are purchased. This is especially a concern with bees that are diseased and have been treated with antibiotics. While the colony may appear healthy, and the combs look fine, the wax is contaminated with the disease-causing spores. As a result, it may be only a matter of time until the disease reappears. Unless you know the age of the comb that comes with your nuc, and fully trust your supplier, it is a good practice to rotate the frames of comb that came with the nuc out of the hive and replace them with new frames of comb as soon as practical.

In fact, nucs with comb older than two years old should automatically be suspect. Dark comb – go somewhere else. Drone comb – go somewhee. AFB scales or *Varroa* poop piles – go somewhere else.

You want to only purchase nucs from reputable beekeepers. Check with your local or state bee association to identify beekeepers that have a good reputation for producing high-quality, disease- and pest-free nucs. In states where inspections are required, nuc suppliers should be able to supply you with a copy of the state inspection certificate from the state apiary inspector that verifies that the nucs you are buying were apparently disease-free and healthy at the time of inspection. Whether you source your nucs in states that require inspection prior to sale or not, reputable suppliers should replace nucs that are found to be diseased within the first few weeks of purchase, or provide a refund.

Nucleus colonies can be a great way to get new hives started. Just take the time to educate yourself as to what constitutes a strong, healthy nuc and make sure the bees you buy fit the bill. BC


Help Barbie Save The Bees!

OBITUARIES

Philip McCabe, July 17th, 1945 - October 20th, 2018. From Drogheda, Co Louth, Ireland. He was the current President of Apimondia.

He was the best known and most respected expert in beekeeping in Ireland. A third generation beekeeper, he was a passionate promoter of beekeeping through his courses at the Beekeeping Summer School in Gormanston College, his talks at Bloom, the Ploughing Championships and in schools and latterly through his work as president of Apimondia, the international federation of beekeeper associations, where he addressed politicians, presidents and princes explaining how we need to do all we can to protect the world's bee populations.

However, it was his regular contributions to Mooney Goes Wild on RTÉ Radio One where he probably reached his largest audience. In his distinctive Monaghan accent, he spoke about his beehives, his father's passion for beekeeping in his childhood home in Newbliss, Co Monaghan and his travels to international beekeeping conferences in South Korea, Iran, Kazakhstan, United Arab Emirates, South Africa and throughout Europe.

McCabe was the main driver behind the successful bid to bring the Apimondia world conference for beekeepers to the RDS in Ballsbridge in August, 2005. At the opening of that event, he spoke about the direct impact of declining bee numbers to human existence. He explained how one third of all food produced in the world is pollinated and 70 per cent of that work is carried out by honey bees. He was outspoken on the damage done to bees by pesticides and genetically modified organisms. And, he served for many years on the executive of the Federation of Irish Beekeepers' Associations during which time members numbers grew from 1,100 to 3,300.

On June 25th, 2005, McCabe attempted to beat the Guinness Book of Records for the largest number of bees attached to his body in what is called a "bee beard". Recorded live for the Mooney Goes Wild program and later included in the RTÉ Radio One documentary on McCabe, The Bee Man, the feat saw McCabe dressed only in his briefs, protective goggles and a back brace (to support the weight of the bees) while beekeepers released thousands of bees which then attached themselves to McCabe. He didn't beat the world record but he did raise funds for the international charities Bóthar and Bees for Development in his attempt.

In the book The Bee Man, McCabe spoke about growing up with seven brothers and one sister in the post office at Newbliss – where his mother was the post mistress and his father worked as a tailor.

Following his schooling, he moved to Dublin to work in a post office and later joined Telecom. He took early retirement from that job and worked for over 15 years as development manager of the Co Monaghan Citizens Information Service.

McCabe, is survived by his wife, Mary, his adult children, Aidan, Deirdre, Gregory and Ciara, son-in-law Martin, daughter in law Martha, many grandchildren, and beekeeper friends around the world.

Ishai Zeldner (1947-2018) founded Moon Shine Trading Company (now called Z Specialty Food, LLC) in Davis, California in 1979, to promote and market varietal honeys from across the country.

Ishai was born and raised in Buffalo, New York steeped in the food business. His grandmother and father established a grocery store in 1926, with a focus on soul food and wild game. Ishai worked in the family business each weekend while growing up.

After graduating from the University of Buffalo, Ishai went to live on Kibbutz Bet Hashita in Israel in 1969 where he first became exposed to bees and honey. He worked with Yusuf Gidron, one of Israel's most renowned beekeepers.

Ishai eventually moved to California in 1978 to get back into bees. While working for California beekeeper Clarence Wenner, Ishai discovered Yellow Star Thistle honey, a Northern California favorite. After working for Wenner, he enrolled in apiculture classes at UC Davis, but soon realized that his true calling was to combine his love for bees and honey with his family background in entrepreneurship and, therefore, to promote Yellow Star Thistle and other varietal honeys.

The market for varietal honeys in the US in the 1980's was extremely limited. It was in this environment that Ishai launched Moon Shine Trading Company, carefully selecting varietal honeys from across the country and marketing them attractively. Moon Shine Trading Company developed a line of varietal honeys and exhibited them at national specialty food shows. Shortly before Ishai's death, Z Specialty Food won a coveted 2018 sofiTM Award from the Specialty Food Association for Northwestern Meadowfoam Honey.

Ishai's passion was infectious, affecting many around him including his family members. His wife, Amina Harris, was his partner in the business and now is Director of the Honey and Pollination Center at the Robert Mondavi Institute for Wine and Food Science, at UC Davis. Their son Josh has taken over the operation of Z Specialty Food. The Ishai Zeldner Memorial Varietal Honey Research Fund has been set up and donations can be made through: mdhaworth@ucdavis.edu or online at https://give.ucdavis.edu/AHPC/FSTZELD. Ishai helped honey grow up in America, leaving us with a sweet legacy of vision and entrepreneurship.

CALENDAR

♦INTERNATIONAL♦

Beekeepers' Caribbean Safari, Trinidad & Tobago, February 12-21. Discover the riches of the Caribbean on the 11-day Safari. The cost is £1965/person.

For information safari@beesfordevelopment.org.

The 5th Edition of the International Symposium on Bee Products in conjunction with Apimondia will be held in Malta May 7-10.

For information **ttps://msdec.gov.mt/en/beeCongress/Pages/default.aspx**.

♦ALABAMA♦

The AL Cooperative Extension System old its 24th Annual Beekeeping Symposium at the Clanton Conference and Performance Arts Center, 1850 Lay Dam Road, Clanton on February 2.

Speakers include Tammy Horn Potter, Reed Johnson, Charlie Parton, Larry Connor and others.

For information visit **www.aces.edu/home-garden/beekeeping/** or contact Lindsey Tramel, 334.844.4450.

♦ARIZONA♦

The 12th Annual Organic Beekeeping Conference will be held March 1-3 at the YMCA Camp in Oracle. The cost is $240/person which includes two nights lodging, meals and presentations. The cost is the same even if not staying at the camp.

For more information visit http://groups.yahoo.com/group/organicbeekeepers/ or contact Dee Lusby (evenings) 520.748.0542.

The American Bee Research Conference (the annual conference of the AAPA) will be held in conjunction with **The American Honey Producers Association Conference** at the DoubleTree by Hilton in Tempe, 2100 South Priest Drive, January 9-12 .

For information **www.americanhoneyproducers.org**.

♦CONNECTICUT♦

Connecticut Beekeepers Association has two dates for their Beekeeping School – January 12 or February 2 (you only attend one). The cost is $50 which includes membership in the Association.

Please register online at **ctbees.org/bee-school**. Space is limited.

♦GEORGIA♦

Georgia Beekeepers Association will hold their Spring meeting February 15-16 in Augusta at Augusta University Summerville Campus.

Speakers include Jennifer Berry, Kim Flottum and Jennifer Tsurado.

For more information visit www.gabeekeeping.com.

♦ILLINOIS♦

Will County Beekeepers Association Bee Prepared 2019 – a full day of workshops for all levels, March 23, at Weitendorf Agricultural Education Center, Joliet Jr. College.

For more information and to register visit **willbees.org**.

♦INDIANA♦

Indiana Bee School XVII will be February 23 at Decatur Central High School, 5251 Kentucky Avenue, Indianapolis. Registration begins at 7:00 a.m. and program starts at 8:30 a.m.

Speakers are JTom Seeley and Jeff Pettis. Sessions for beginners and advanced. Over 30 vendors. Pre-registration is $35/member and $45/non-member including lunch.

For information and to register visit h**ttp://indiana-beekeeper**.com or contact Mike Seib, 317.432.5342 or beekeeper.indiana@yahoo.com.

♦MICHIGAN♦

MI Beekeepers Association will hold its Spring Conference, March 8-9 at Kellogg Hotel and Conference Center, East Lansing.

Keynote speaker is May Berenbaum.

For information and to register visit **ww.michiganbees.org**.

♦MISSOURI♦

Eastern Missouri Beekeepers will hold their annual workshops and banquet in St. Louis, February 8-9, 2019 at Moritz in Fenton. Tuition for the workshop is $85/person by January 20. After January 21 is is $95/person.

Speakers include Kim Flottum, Andony Melathopoulos, Stephen Pernal, Becky Masterman and Ana Heck. There are courses for beginners and advanced. Lunch and refreshments are included as well as course materials, handouts, a reference book and catalogs.

For information and to register visit **www.easternmobeekeepers.com**. Or contact **info@easternmobeekeepers.com** or 314.669.1828.

♦NEW YORK♦

Southern Adirondack Beekeepers Association will hold their annual one-day seminar March 30.

Speakers are Michael Bush and Kim Skyrm.

For more information isit **http://adirondackbees.org**/.

♦OKLAHOMA♦

The Northeast Oklahoma Beekeepers Association will hold The Big Bee Buzz March 29-30 at Venue 68 in Tulsa.

Speakers include Dennis vanEngelsdorp, Jerry Hayes, Ed Levi and Katharina Davitt. The price is $40/pre-register and $50/at the door.

For more information visit **neoba.org**.

♦SOUTH CAROLINA♦

The american Beekeeping Federation Conference and Tradeshow ill be held January 8-12 at the Sheraton Myrtle Beach Convention Center Hotel in Myrtle Beach.

For details and to register please visit **www.abfnet.org**.

♦TENNESSEE♦

Honey Convention March 21-23 at Fountainhead College of Technology, 3203 Tazewell Pike, Knoxville.

For more information and to register visit **www.honeyconvention.com**.

♦TEXAS♦

Austin Area Beekeepers Association will hold their seminar February 2 at the Austin Marriott North, 2600 La Frontera Blvd., Round Rock. The cost is $70.

All experience levels are welcome. Over 35 presentations will be offered.

For more information email **ance@beekeepinghelp.com**. Register at https://aabaseminar2019.eventbrite.com

♦WYOMING♦

Wyoming Bee College will be held March 23-24, with a preconference workshop offered March 22. The cost of the conference is $85, workshop $125 or both for $195.

For more information visit **https://visitcheyenne.regfox.com/bee-college-2019**.

Display Advertisers

Meeting Magazines! Holding a meeting or conference? Give us a month's head start and how many you need and we'll send them out. Same with 2019 calendars while supplies last, up to 50. Email Amanda@beeculture.com with your request.

The experts assured us we'd never pull this off, but we had other ideas. I wore my ditch company ball cap, squeaky clean Wrangler jeans and a Carhartt cowboy-yoked canvas shirt with pearl snaps. Kristina had on her best faded pink dungarees. We were loaded for bear.

"Kristina," I said, "We're gonna have some fun!"

It was the day after the mid-term elections, and we were at the upstairs meeting room of the Colorado Department of Agriculture in Broomfield, for the appointment of the beekeeper representative on the state Pesticide Advisory Committee. Kristina was the candidate put forth by the 138-year-old Colorado State Beekeepers Association (CSBA). The Ag Commission received more than 350 online petitions supporting her candidacy. The state complained that we overwhelmed their e-mail! Good! Yet despite her beekeeper support, master's degree in entomology and 33 years doing pollinator research and working with bees on at least two continents, Kristina's appointment was to be no slam dunk.

You'd think this might be a hard position to fill. Who'd want the job? An appointee could look forward to quarterly all-day meetings with a 15-member panel of pesticide stakeholders, free lunch included. Do they ever accomplish anything?

Historically, CSBA's relationship with the Colorado Department of Agriculture has been rocky. But Kristina wanted this job, and she had a rival – a veteran beekeeper who keeps some 100 or 200 colonies. His name was put forward by the other Colorado state beekeeping organization – the recently formed Colorado Professional Beekeepers Association (CPBA). They primarily represent the interests of commercial beekeepers. Their particular field of interest seems to be neonicotinoid pesticides, which they regard as a boon to beekeepers, since their use theoretically cuts down on the need for chemical sprays.

This is a radical point of view not representative of the mainstream of American commercial beekeeping.

The philosophy of our group – the CSBA – is that like other pesticides, neonics pose a threat to pollinators, including our native bees, until proven otherwise. We understand that we live in a complicated and imperfect world. We embrace reasonable compromise. We strive to keep an open mind and pledge to follow the science and never ideology, wherever that leads us.

This is why I wanted Kristina in that pesticide advisory seat! She has the interest and the scientific training to keep up on all the latest research. She's beholden to no one. She only wants what's best for our pollinators.

The other side had obviously done some politicking, too. They'd solicited letters of endorsements and contacted at least some of the nine members of the Ag Commission prior to the meeting.

I had a surreal and unforgettable encounter with one of the commission members, before the meeting even started. I introduced myself as the CSBA president, and as I tried to shake her hand, she jerked hers away, almost in horror, I thought, as if she'd touched a snake!

Kristina's opponent did not attend the commission meeting, nor did any representative of the CPBA. I explained to the commission why I thought Kristina would make an ideal addition to the pesticide committee. Then Kristina gave her pitch. She emphasized her willingness to represent all Colorado beekeepers, and to work to soften any lingering rancor between the two state bee clubs. Bravo! She made my heart sing, the little darling.

Kristina's campaign speech was followed by a ringing endorsement from our faithful and levelheaded ally Joyce, representing Colorado's People and Pollinators Action Network.

I was surprised at how many questions the commission asked Kristina. They threw her a few curveballs, but she hit 'em out of the park.

We had the big guns, most of them, anyway. You couldn't really argue with Kristina's experience or scientific background or the 350 petition signatures, but we lacked a certain element of street cred – the commercial angle. We'd been painted "a left-wing hobby group" by certain members of the loyal opposition. And the Ag Commission, comprised of prominent farmers and ranchers, leans toward commercial interests. I was careful to point out to the commission that the CSBA represents commercial as well as backyard beekeeping interests. In fact, some commercial beekeepers belong to both groups. Kristina belongs to both. I emphasized that on policy matters, CSBA swims in the mainstream and tends to follow the lead of the American Beekeeping Federation and the American Honey Producers Association.

When I circulated a last-minute letter of endorsement from commercial beekeeper Tom Haefeli, the potato rep took notice. "The Haefelis are famous in the San Luis Valley," he proclaimed. "I can't go against Tom. No way." So we were assured of at least one vote!

The woman who would not shake my hand kicked up a little dirt. I bit my tongue. But the Colorado cattle ranchers' representative chimed in that she thought Kristina an ideal candidate, and by the way, she had some hobby beekeepers who kept bees on her ranch in Routt County, and they were decent folk, surely as good as any commercial beekeepers! So there! She formally nominated Kristina for the beekeeper seat, and the vote carried, 7-2.

We didn't stay for the rest of the meeting. On our way out the door, I thanked the ranchers' rep. I was so frankly stunned by the vote, I confess I melted and kissed her hand. I'm not sure this was politically correct, but she laughed and shot back, "So when do I get my honey?"

Outside in the hall, Kristina and I let loose and knocked down a high-five. Got 'er done!

Ed **Colby**

Kristina

Blue Sky bee supply®

LEGA HONEY WARMING CABINET

$1199

Honey liquefier cabinet with insulated walls for crystallized honey.

PROVAP 110 OXALIC ACID VAPORIZER

#PVOV- $485.00

LYSON CANDLE MOLDS

We have many candle mold design options and sizes available online

WINTER PATTIES

#MB-WP $3.75/Patty
#MB-WP40LB $59.95/40lb box
For those colonies running light on stores and those needing to feed in emergency situations.

POLYSTYRENE HIVE KIT

Single Deep Polystyrene Hive Kit **$59.95**
Includes: 1 screened bottom board, 1 entrance reducer with shutters, 1 deep hive body (unassembled), 1 reversable cover. Available in 8 & 10 Frame.

POLYSTYRENE 6 FR NUC KIT

$46.99

Kit includes 1 screened bottom board, 2 entrance reducers, 1 deep frame body (unassembled), 1 reversible cover. Frames and foundation **NOT INCLUDED.**

Honey Bottling

CLASSIC PLASTICS

8 oz - $19.99/50 ct. Case
16 oz - $23.99/50 ct. Case
32 oz - $39.99/50 ct. Case
No Caps

DECO EMBOSSED JUGS

5 LB- $78.35/72 ct. Case
3 LB - $99.95/126 ct. Case
No Caps

GLASS MUTH JARS

4 oz - $28.49/36 ct. Case
8 oz - $12.95/12 ct. Case
16 oz - $16.95/12 ct. Case
includes corks

PLASTIC PANEL BEARS

2 oz Panel Bears $229.95/800 ct. Case No Caps
6 oz Panel Bears $181.45/660 ct. Case No Caps
8 oz Panel Bears $144.95/525 ct. Case No Caps
12 oz Panel Bears $114.95/400 ct. Case No Caps
16 oz Panel Bears $94.69/240 ct. Case No Caps
24 oz Panel Bears $89.50/195 ct. Case No Caps

CLASSIC GLASS JARS

8oz - $14.50/24 ct. Case
16 oz - $8.45/12 ct. Case
32 oz - $12.95/12 ct. Case

GLASS SKEP JARS

12 oz glass jars
$10.45/12 ct.
includes Gold Metal lids

FOR BEES. FOR HONEY. FOR EVERYONE | (877) 529-9BEE | www.blueskybeesupply.com

ProDFM

DIRECT FED MICROBIAL FORMULA

3X STRONGER

ProDFM is a safe, beneficial option for strengthening your bees' immune systems

- Helps improve colony health
- A safe product that uses natural bacteria
- Impedes chalkbrood (Ascophera apis)
- Positively affects nurse bees' vitellogenin reserves
- Aids in fermentation and digestion of beebread
- No harmful residues
- No resistance
- Quick and easy to use

MADE IN USA

SALE

Mann Lake Ltd. FREE SHIPPING Mann Lake Ltd.

10 Treatments DC-144 - 100 g	**$18.95**
100 Treatments DC-145 - 1 kg	**$89.95**
1000 Treatments DC-143 - 10 kg	**$459.95**

MANN LAKE
WE KNOW BEES

800-880-7694
www.mannlakeltd.com

Hackensack, MN • Wilkes-Barre, PA • Woodland, CA • Marshall, TX

*Free shipping applies to most orders over $100 sent standard ground service within the lower 48 states. Prices effective 1/1/19 thru 1/31/19 and are subject to change without notice.