2017 ANNUAL HONEY REPORT

ROOT PUBLICATIONS

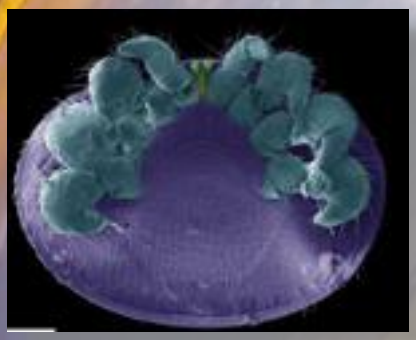
MAY 2018

Catch The Buzz™

Bee Culture®

The Magazine Of American Beekeeping

www.BeeCulture.com



Mite Testing

Manuka Honey

What Do Bees See?

Better Records

ROOT PUBLICATIONS $4.99

SUIT UP!

PROTECTIVE SUITS, JACKETS VEILS & GLOVES

Domed Hood
Veil

Clear Vue
Hat & Veil

Pockets
available to help hold your tools

Sealed Tight
Zipper & Velcro to seal the veil seam

Master Beekeeper Suits
Made with 100% Cotton

Weightless
X-Large Ventilated Jacket weighs only 1.5 lbs.

Suits for Kids
age 4-12

Ventilated Wear
built of 3 layers of breathable mesh material

www.BrushyMountainBeeFarm.com | 1-800-233-7929

FREE SHIPPING ON MOST ORDERS **OVER $150*** SOME RESTRICITONS APPLY

Request your **FREE** 2018 Catalog

BRUSHY MOUNTAIN BEE FARM

Brushy Mountain Bee Farm

*Serving Beekeepers the Best for **40 YEARS***

BEST QUALITY | BEST SERVICE | BEST SUPPORT


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

NOD
NATURES OWN DESIGN
APIARY PRODUCTS

2 OPTIONS FOR Organic VARROA CONTROL

CERTIFIED INPUT FOR ORGANICS
bio gro NZ CERT

EXTENDED SHELF LIFE

FORMICPRO

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

Mite Away® Quick Strips

14 DAY
2 STRIPS APPLIED ONCE

20 DAY
1 STRIP APPLIED TWICE

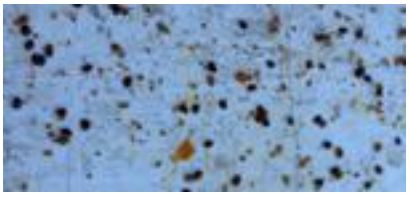
7 DAY
2 STRIPS APPLIED ONCE

21 DAY
1 STRIP APPLIED TWICE

DAYTIME TEMPERATURES HIGHS NEED TO BE BETWEEN
50°F AND 85°F DURING THE FIRST 3 DAYS OF TREATMENT.

HIGH EFFICACY
Kills Mites Under the Brood Cap

RESIDUE FREE
Treat during the Honey Flow. Leaves no residues in wax or honey.



NO RESISTANCE
Formic Acid has been used for over 30 years without any known resistance.

Learn more by visiting www.nodglobal.com

Healthy Bees. Healthy Planet.

Now available through your beekeeping supply company

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

ACORN™
BEEKEEPING EQUIPMENT

Ready Now For The 2018 Bee Season!

The New Standard of Excellence in Plastic Frames and Foundations

Call Today!
877-255-6078
info@acornbee.com www.acornbee.com

Acorn One Piece Plastic Frames

- Flatter, Stiffer, Sturdier
- Redesigned Mega Strong Ears Last Forever
- 9-1/8" 6-1/4" Sizes

No Bowing or Warping

Plastic Snap-in Foundations

- Fit well in 9-1/8" and 6-1/4" Wood Frames
- Optional Breakaway Communication Hole

Heavy Waxed Available

Drone Combs

- Integrated Pest Management (IPM)
- Varroa mite control
- Queen Breeding
- 9-1/8" 6-1/4" Sizes

Brand New!

Nick Lissaman
25 years experience
info@acornbee.com
www.acornbee.com
13818 Oaks Ave. Chino, Ca 91710

MORE BROOD! - MORE BEES! - MORE HONEY!

EXCELLENT BEE ACCEPTANCE!

Call Acorn Bee Today!
877-255-6078

VISA MasterCard

PROUDLY Made in USA

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

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

Drone Frames

- IPM Method for Varroa mite control (No Chemicals)
- Perfect for Queen breeding

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

Pierco®

Genuine Beekeeping Equipment

- Buy Pierco - Buy Quality
- Factory Direct Store
- New Lower Prices - Buy Now and Save!
- No order too Small or Large

HOBBYISTS | SIDELINERS | COMMERCIAL BEEKEEPERS

Check us out at: **www.Pierco.com**

Pierco is celebrating our 40 year anniversary.
We invented the one-piece Plastic Frame and Foundation.
Pierco is known to provide the best designed Plastic Frame and Foundations available in the market.
We are the "Original" and have set the Quality standard.
Call now and let us serve you.

FOR ALL YOUR BEEKEEPING NEEDS

BEEKEEPING KITS

TOOLS

We Offer
DOUBLE & TRIPLE WAX

PROTECTIVE WEAR

SUPPLEMENTS

Call or Visit us at:

Made in the USA

Factory/Store Address: 680 Main St. | Riverside, CA | 92501
Get Connected | (909) 575-2013

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

Bee Culture

May Features . . .

Page 79

Page 41

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

Kelsey Kelly – Publications Assistant, KKelly@rootcandles.com, Ext. 3220

Contributors

Clarence Collison • James E. Tew • Ann Harman • Kim Lehman • Phil Craft • Larry Connor

Connie Krochmal • Jessica Louque • Toni Burnham • Ross Conrad • Jennifer Berry • Ed Colby

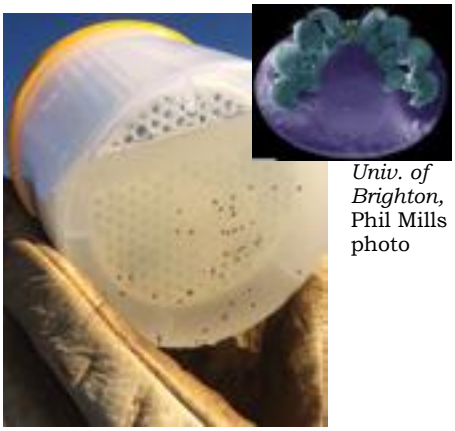
POSTMASTER: Send address changes to
BEE CULTURE, The A.I. Root Co., 623 W. Liberty St., Medina, OH 44256

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), May 2018, Volume 146, Issue 5, 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



Univ. of Brighton, Phil Mills photo

Counting mites is the name of the game. ©Camilius Lay.

Betterbee®

Beekeepers Serving Beekeepers®

2018 Catalog Now Available!
Call or go to our website to request your free copy.

Kick-start your spring season!

Price: $19.99

Varroa Easy Check

This small device allows you to monitor quickly, easily and reliably.

First collect the bees in the internal colander, and fill halfway with alcohol or windshield washer fluid. Gently shake the bees in the fluid, and finally count the number of mites that fall to the bottom.

Lyson 6 Frame Nuc Box

This lyson nuc is made of sturdy high density polystyrene and holds 6 frames. The frames rests are reinforced with plastic and both the bottom board and outer cover are ventilated.

Price: $41.10

"Bee"neficial Seeds

White Dutch Clover

Use in your lawn, as a ground cover, cover crop or for erosion control!

Price: $7.57 per pound

Autumn Beauty Sunflower Mix

This sunflower mix will brighten up your garden and your bees!

Price: $8.60 per 4 oz.

More seeds available!

Xerces Urban & Garden Pollinator Mix

This seed mix includes native and naturalized wildflowers.

Price: $9.95 per 4 oz.

WWW.BETTERBEE.COM · 1-800-632-3379 · 8 MEADER ROAD · GREENWICH, NY 12834

Bee Culture's Best . . .

Page 81

In Every Month –

Join us for

Our 10th Annual FIELD DAY

The American Beekeeper

Saturday, June 2, 2018

Gates at 7 AM • Opening introduction at 8:30 AM
All ages welcome

Give us a call or go online to register today!

Kelley Beekeeping
SERVING THE BEEKEEPER SINCE 1924

1-800-233-2899
www.kelleybees.com

Bloom Clothing Co.

As a working 20-year-old college student in July of 2017 I was tired of commuting two hours a day and working 60 hours a week. I wanted something better for myself and to help the world through my work. That is where Bloom Clothing Company started. I was driving home from one of those tiring days on the highway where I saw a "Save the Bees" sticker on the back of a minivan. I have always been fascinated with bugs ever since I was little and so I investigated the "Save the Bees" sticker and found the Honeybees Conservancy. They do phenomenal work in researching Colony Collapse Disorder as well as building sanctuary hives in food desserts to start urban gardens. This was my way to help the world! I knew several people in the apparel and promotion industry, so I contacted a talented designer, Krysti Horvat, and a miracle worker, Aubrey Cocklin, to help me build my brand.

Ever since the creation of Bloom Clothing Company back in August I have set up and amazing base in the Cleveland State University Community and have done over 250 sales with many being spread from Florida to New York to even Las Vegas! With each one of these sales comes a hand-written note thanking our customers for their support along with wildflower seeds inside to plant for the bees. This empowers our customers to take matters into their own hands on a personal level. We donate 12% of our product profits to the Honeybee Conservancy which will help the honey bees out as well as our customers planting those lovely wildflower seeds for them.

We've seen extraordinary growth over the past few months, including branching out into a retail store in downtown Cleveland, and we are excited to see us bloom into the upcoming Summer.

Tyler Hobel
Founder & CEO,
Bloom Clothing Co.

More ELAP$$ For Beekeepers!

We at AHPA are thrilled to announce that our lobbying has paid off!

The Emergency Livestock Assistance Program (ELAP) will no longer be capped at $20 million annually. The federal budget deal passed last Friday included a provision that uncaps ELAP spending for beekeepers. Even better, the uncapping is retroactive to 2017 claims and permanent as long as the program continues to be authorized by Congress.

Since we first lobbied to include this program in the 2008 Farm Bill, spending has been capped by statute, which in recent years has meant that eligible beekeepers have received as little as 50% of the payments they otherwise would be entitled to under the program. Maximum claims will now be paid annually at the full $125,000 per claimant. While it is never easy to watch your bees die off, it is at least comforting to know that this federal support exists.

We hope you will join us in thanking our hard-working Washington team and Executive Committee members for the time, travel and treasure they have spent ensuring this important result for beekeepers across the country.

And we would be remiss not to thank our Senators and Representatives. Help us help you by making a quick call to your members of Congress and letting them know that we appreciate their support. Specific names and phone numbers are included below, but never hesitate to reach out to other House and Senate members to let them know that you appreciate this provision being included in the disaster assistance portion of the budget bill.

Regardless of where you live, please thank:

- Senator Heidi Heitkamp (D-ND) for leading on this issue and for keeping us apprised throughout the process. 202.224.2043
- Senate Agriculture Committee Chairman Pat Roberts (R-KS) 202. 224.4774
- Senate Agriculture Committee Ranking Member Debbie Stabenow (D-MI) 202.224.4822

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

- House Agriculture Committee Chairman Michael Conaway (R-TX) 202.225.3605
- House Agriculture Ranking Member Collin Peterson (D-MN) 202.225.2165

Finally, for those who have been losing bees but have not yet signed up for ELAP, don't forget to do so this year. Reach out early to your local FSA office to make sure you are keeping the records you need and filing timely applications. Pay special attention to the "ELAP Honeybee Assistance Fact Sheet".

American Honey Producers

Hive Monitoring At EAS

EAS 2018 will feature a day-long electronic hive monitoring track with speakers from current suppliers and researchers working on the next generation of these technologies. Learn how weight, temperature, audio, video, and other sensors can help you keep your colonies healthy and productive. Details at: **http://www.easternapiculture.org**.

Beekeeping & Honey Bees

—Our Business Since 1863—

NOW OFFERING FREE SHIPPING *on purchases of $100 or more*

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

Saskatraz
Queens Produce Superior Workers

Invest in Saskatraz Hybrid Production Queens

- EXCELLENT HONEY PRODUCTION
- GOOD WINTERING ABILITY
- SELECTED FOR INCREASED VARROA TOLERANCE AND RESISTANCE TO BROOD DISEASES
- SHOW INCREASED HYGIENIC BEHAVIOR

Certified Saskatraz hybrid queens are produced in Northern California, exclusively by Olivarez Honey Bees using Saskatraz breeder queens from Meadow Ridge Enterprise Ltd. We are proud to offer Saskatraz queens as they are selected for honey production, wintering ability, temperament, tracheal mite resistance, varroa tolerance/resistance and brood diseases. The Saskatraz breeding program, pioneered in Canada by Albert Robertson and collaborators (www.saskatraz.com) uses recurrent natural selection to select for varroa tolerance in productive colonies with good economic traits. Investing in these queens gives your hive the best potential for success. In the U.S., Certified Saskatraz production queens, with a certificate of authenticity are only available through Olivarez Honey Bees and our network of authorized distributors.

NOW TAKING ORDERS FOR SUMMER AND FALL QUEENS

OHB

BIQ

Beekind for Mankind

OHBees.com

CALIFORNIA	HAWAII	TOLL FREE
530. 865. 0298	808. 328. 9249	877. 865. 0298

EST. 2010

MOTHER EARTH NEWS FAIR

LEARN PRACTICAL SKILLS AND USEFUL INFORMATION ABOUT ORGANIC GARDENING, FOOD PRESERVATION, MODERN HOMESTEADING, RENEWABLE ENERGY, NATURAL HEALTH, AND MORE!

New!

Discover more interactive programming than ever before!

HANDS ON

Stand beside an instructor and make cheese from scratch, test garden tools, weave fiber, make tinctures, press cider, and more!
PLUS: At many of these "hands-on" workshops, we'll send you off with what you made!

FEB	17-18	**TEXAS** Belton
APR	28-29	**NORTH CAROLINA** Asheville
JUNE	2-3	**MARYLAND** Frederick
AUG	4-5	**OREGON** Albany
SEPT	14-16	**PENNSYLVANIA** Seven Springs
OCT	13-14	**KANSAS** Topeka

Tentative schedule.
Please check our website for updates.

"In a day when many people feel disempowered, fearful, and vulnerable, few things bring more encouragement, abundance and self-reliance than participating in a Mother Earth News Fair. From energy to food, you'll find a can-do spirit and positive attitude to help you understand that we can heal our nest and live regeneratively."

— Joel Salatin

FOR MORE INFORMATION VISIT WWW.MOTHEREARTHNEWSFAIR.COM OR CALL 800-234-3368
FOR DISCOUNTED PRESALE PASSES VISIT WWW.MOTHEREARTHNEWS.COM/STORE/OFFER/BEE18

Look What's New –

BEECABULARY ESSENTIALS. By Andrew Connor, with a foreword by Dewey Caron. ISBN 978-1-878075-50-5. Published by WicWas Press. 9.5" x 8.5", soft cover, 234 pgs., color throughout. $34.00 from Wicwas.

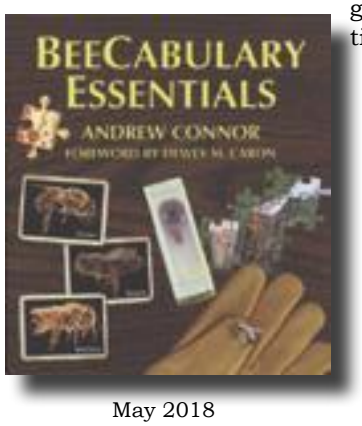
Dewey sums this book quite will in his Preface. *The BeeCabulary Essentials* concept is really simple but very useful – a book of beekeeping terms-all of them-as a teaching tool to educate new beekeepers and further the education of more experienced beekeepers.

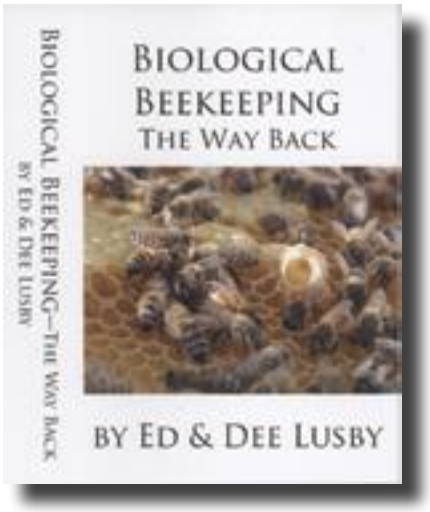
And I'm sure you recall your first beginner's class experience of learning that there was a whole new vocabulary out there and you didn't have a clue to what most of what the instruction was trying to get across. Once you've been at this awhile – classes, read a few books, attended a few lectures - you begin to have a feel for what folks are telling you, but right off? They may as well have been talking Greek. Right?

The chapters make it easy to know where to start looking when you can't find something anywhere else – Types of Bees, Anatomy, Behavior, Bees, Beekeepers, Hives, Swarming, Queens, Botany, Products and Pathogens. There are hundreds of photos that illustrate almost everything covered in the book. Each definition is easy to use, not too long, and usually illustrated. There's an easy to use index and good references at the end.

And, just to be clear, you may already recognize the author's last name. He is the son of Larry Connor, Publisher at WicWas Press, and the author of several of the Essential books. It's good to see another generation stepping up, and this is a great introduction.

Kim Flottum





Biological Beekeeping. The Way Back. By Ed and Dee Lusby. Published by X Star Publishing Company, Nehawka, Ne 68413. **http://www.xstarpublishing.com**. ISBN 978-161476-104-4. 6" x 9" Hard cover. 640 pages. Black and white. Available from the publisher, Amazon and other book sellers. SRP $55. Available for a time from author at additional cost. Contact the publisher.

If you don't know about Ed and Dee Lusby, small cell beekeeping, biological beekeeping and their sustainable beekeeping techniques, then you haven't been paying attention, or you've been living under a rock somewhere.

Although Ed passed several years ago, Dee and her followers have kept up their practices of making small cell foundation, recycling beeswax, natural breeding for resistant bees, and actually, healthier bees that survive without chemical insults and make honey.

The first third of this book is what they have done and how they have done it. The remainder is the supporting current and historical data that convinced them to begin these practices. Dadant, Root and the USDA are cited often in this section. There are a score of articles they have published, and that have been published on their work here also, some of them from *Bee Culture* over the years. I toured beeyards in Arizona with them some time ago, and have published articles on their story of success using small cell beekeeping.

If you're not familiar with the small cell story it goes something like this. In their natural state, that is living in the wild, honey bees construct comb with cells about 4.9 mm wide or so. Decades ago, beekeeping companies undertook it to produce bigger bees, using foundation with comb about 5.5 mm or so. These larger bees, it was thought, could fly further, carry more and work harder. It's not clear that this happened, however. But because they were bigger they had longer tongues and were able to forage on flowers smaller bees could not forage on. At least that's what the foundation companies said. Little effort was made to return to smaller bees.

This belief continued, basically, until *Varroa* entered the picture, and the Lusby's and others looked and decided that a smaller, natural sized cell would accommodate fewer, if any female mites to reproduce more mites. Moreover, these smaller bees emerged sooner than their larger cousins thus reducing further mite reproduction, and thus mite control was simplified.

There is so much more to this than I've captured here, and if you are interested you need to relive the history of this movement, the data that supports it and become aware of the people and the biology that led to, and continues to propel small cell beekeeping.

Kim Flottum

The Healing Powers of Honey, by Cal Orey, and, *The Healing Powers of Tea*, by Cal Orey. Both published by Kensington Publishing, Inc. ISBN for Honey, 978-0-7582-7455-7, for $7.99, 4" x 6.5", 394 pgs, black and white; and Tea 978-0-8065-3826-3, for $15.95, 6" x 9", 294 pgs, black and white. Both soft cover.

These are the kind of books you want on your farm market table, or if you have a store, somewhere on a shelf. You can buy them in bulk for much less than retail and resell at a decent profit. I was consulted early on for the honey book, and it is basically a collection of everything good you've ever heard about honey all in one place, with every statement referenced. The Honey Board, and a host of other experts are quoted and

referenced. If you've heard, or a customer has heard of something good about honey, you can find it here. There's some history, a bit about flavors, using it with cinnamon, tea (see the Tea book, next), cooking with honey and resources and recipes.

The Tea book is similar. It talks about, black, green, white, red and herbal teas, their nutrients, history and more about these and other teas. There are recipes for cooking with teas, and again, pages of resources. And, of course, there is no other combination that beats tea and honey, and that relationship is explored again. And of course, teas contain a boatload of healthy polyphenols, and more to add to the rest of your healthy diet.

I like Cal's books, she has more on vinegar, olive oil, chocolate and coffee. They are fast and easy to read, and good references for the topics covered.

Kim Flottum

Bloom Clothing company is committed to donating a portion of all profits to the Honeybee Conservancy to build and maintain hives, educate the youth, and spread awareness of this growing issue. See the letter in our Mailbox section for more about Tyler Hobel, the founder of Bloom Clothing. To see pricing and products visit **www.bloomclothingcompany.com**.

The Honeybee Conservancy is a 502c3 non-profit that was founded in 2009. All donations are tax deductible, so what are you waiting for? To make a donation direct to the Conservancy visit **http://thehoneybeeconservancy.org/**

The Backyard Pollinator is an individual block of leafcutter bee nesting habitat containing bee larvae ready to hatch in warm weather. It can be placed anywhere that you wish to observe the activity of leafcutter bees and the pollination of nearby flowers.

Along with the Backyard Pollinator blocks, we offer Hatch & Release Leafcutter Bees, Wildflower Pollinator Mix and Commercial Leafcutter Bee Blocks.

The Backyard Pollinator is an essential item for curious children, avid gardeners, nature lovers, budding entomolgists, excited Grandparents, super Moms, cool Dads, the ecologically aware and entry level beekeepers.

This product is a piece of our farm scaled down to fit any situation whether in your backyard, on an apartment window, in a classroom and everywhere in between.

From Vancouver to Nova Scotia, from Alaska to Florida, the Backyard

Pollinator is our way of getting leafcutter bees to you in a convenient package, at an affordable price.

The true value of a Backyard Pollinator is not what comes inside the package. It is the a magical experiences you will encounter during the growing season.

Are you ready to enhance your whole life adventure and rediscover the connection to important values that have been lost in the daily grind of life? Visit **backyardpollinator.ca for more information**.

CanningCrafts has been selling colorful, adhesive canning jar labels since 2010. Our shop started on Etsy with just a few canning labels. Now we have over 300 products that include custom labels, cloth covers for mason jars, hang tags, and DIY cookie mason jar gift sets. We're always adding peel and stick labels to our shop based on customers' recommendations. Whether it's something basic like an Applesauce label or more unusual like Watermelon Jelly, we've got you covered. Customizing honey labels for backyard beekeepers is one of our specialties. Our canning jar labels are great for farmer's market sales, baked goods, and gift giving. Use them to dress up the mason jars in your own pantry or to give to friends and family!

Bee Culture

Magazine Of American Beekeeping

2 FALL DAYS IN OCTOBER...

4 SUCCESSFUL COMMERCIAL BEEKEEPERS

AN OPPORTUNITY YOU WILL NEVER GET AGAIN!

Listen as four very different commercial beekeepers share how they spend their year; telling us, in their own words and pictures "MY STORY." Sit back and relax as each fascinating guest spends ½ a day explaining their operations, where they have been and where they are going.

October 19 - 21, 2018

Bret Adee – With locations in California, South Dakota, Nebraska, Adee Honey Farms is probably the worlds biggest beekeeping operation. Adee Honey Farms pollinates primarily almonds in California, but also travel to pollinate cherry and apple trees in Washington and Oregon. On top of that they also produce millions of pounds of honey each year. Follow all those bees for a whole year to see how the biggest makes it work.

Mike Palmer – Mike specializes in the Sustainable Apiary using production colonies, nucleus colonies and mating nucs. That strategy gives him enough bees to produce Vermont's prime comb honey and sell queens and nucs to others in the area. He isn't one of the largest but he is one of the best. Learn the how's of this northern, non-migratory beekeepers success story.

Join us in the conference room at 640 W. Liberty, Medina, OH

Registration begins May 1 and space is limited so don't wait!

Only $50 per person!

To See Lodging Information And Register Visit www.beeculture.com

John Miller - John owns Miller Honey Farms which is based in Blackfoot ID but also has locations in Gackle, ND and Newcastle, CA. Like many commercial beekeepers, John trucks his bees to several states for pollination but what John does differently from most is he winters his bees in advanced wintering buildings in North Dakota; something which is virtually unheard of in the commercial beekeeping industry. Come listen to how he makes it all come together into a successful operation.

Ray Olivarez – Carefully chosen locations in Northern California, Montana and Hawaii's Big Island allow Olivarez Honey Bees to offer customers premium-quality queens and bees year-round. OHB is surely one of the largest package and queen providers in the US with specialty climate controlled trailers that allow them to truck packages across the country. In addition to selling queens and packages, Ray's team also provides almond pollination and produces honey. To top it all off they offer a retail store to die for and host a large "Hobby Day" every spring. Sure to be a fascinating 4 hours hearing just how they do it the OHB way.

INNER COVER

I mentioned New Zealand last time, but when we returned after being there for 12 days were so rushed getting the April issue out that I didn't get to tell much about the trip. If you've been to that part of the world I can't add much about the 13 hour plane ride and losing a whole day – we left on a Saturday and arrived on Monday, missing Sunday altogether. We arrived in Auckland, on the north island and over the course of 11 days worked our way south mostly along the east coast to the southern tip of that Island at Wellington.

Our trip was arranged by beekeepers there, and we mostly stayed with beekeepers the whole time. That in itself made it an unusual adventure, for we'd be with one family for a day or three, then be handed off to another family, and so on. A couple of times we stayed in hotels, and for three nights at a camp for a three day beekeeper's meeting.

On a map, New Zealand's most northern tip is about the same as Buenos Aires, two thirds of the way down on that continent, and it's most southern point is about equal to the most southern tip of South America. It's about half way between the equator and Antarctica. So, we left the end of February - cold, dark and Winter, and arrived in Summer – warm, bright, and welcome.

We stayed that first night with Jeremy and Fiona O'Brien, commercial beekeepers who don't make manuka honey, but run the cleanest honey house I've ever seen, but then, all the honey houses we saw were the cleanest we've ever seen. Not making manuka honey isn't rare, but because of the value of that crop it is becoming less common as more and more beekeepers seek out the precious stuff. But people still actually want local honey, and, to be honest, manuka honey isn't on my list of favorites as a food. Or even on my list at all actually.

So there it is. Manuka honey. The flowering shrub *Leptospermum scoparium* (Mānuka in Māori).

From the BEES AND TREES website, a honey packer in New Zealand –

The history of Manuka honey is that until the early 1990s, it was just one of a number of really nice honeys produced from flowering native New Zealand trees. Enter Dr. Peter Molan of the Waikato University in New Zealand, who through his research discovered a very unique and special property of manuka honey. Dr Molan was studying the health properties of honeys which are normally attributed to a natural mild hydrogen peroxide antiseptic released when the enzyme glucose oxidase produced by the bees as a preservative in the honey comes in contact with moisture in the body.

However, this "peroxide activity" is easily destroyed by exposure to fluids, heat and sunlight. The discovery that Dr. Molan made was that Manuka honey had a different property, what he termed a "non-peroxide activity"(NPA), which was more potent and stable, opening up the possibility of a wide range of uses. The term "Unique Manuka Factor," or UMF was coined (and trademarked) to describe this property which varied in strength as measured from different batches of Manuka honey produced in various parts of New Zealand, and from different species of manuka plants, of which there are several.

Professor Thomas Henle at the Technical University of Dresden in Germany set out to isolate what it was in Manuka honey that was producing this antibacterial affect. They isolated a compound, methylglyoxal (MGO), as having a direct correlation to the UMF rating of Manuka honey. UMF is measured by observing the inhibition to growth of bacteria within honey samples. MGO can be directly measured in ppm or parts per million. UMF ratings range from 5 to 15 typically, MGO from 100-550ppm.

For labeling purposes, MGO is trademarked by Manuka Health New Zealand Ltd. UMF is registered and controlled by The Active Manuka Honey Association (AMHA). The largest member of AMHA is Comvita New Zealand Ltd.

What isn't told here is that when manuka honey is first harvested, it has UMF ratings of five - 15, but after it sits for a year, in a drum at right about 70 degrees, that rating can increase to over 20, or more. And the more UMF there is, the more beekeepers get paid. Twenty dollars a pound for the good stuff isn't uncommon. That's quite an investment though. And storage is costly, and it has to be done right or the honey can change. But how much honey is in a drum, at $20/pound? That's why regular honey beekeeper numbers are dwindling.

Manuka is a shrubby plant. Only 5' or 6' tall at the most, it primarily grows on land that isn't used for anything else. Steep hill sides, tops of mountains, stream edges, rocky bluffs. New Zealand is totally volcanic in origin so there are lots of steep hills, rocky bluffs and marginal land with only an inch or so of topsoil.

Manuka.

Empty, valueless land as far as NZ farmers were concerned. And the honey itself is like heather honey – it turns to jelly after it's extracted – the term is thixotropic – and you need a very special machine to insert a vibrating pin into every cell to liquefy it so it can be extracted.

Before manuka, beekeepers there, like here, had locations on a farmer's land that produced honey for mostly the whole season, would set their bees down and harvest at the end of the season. There are a few ag crops needing migratory pollination so some would move bees for that, especially to the south island for Kiwi, but migratory beekeeping doesn't dominate the scene.

After manuka, the world changed for NZ beekeepers. First, there are now three times as many beekeepers as there were before so even finding a level place to put bees is getting difficult. Beeyards near manuka stands have become fought-over locations, with farmers charging an arm and a leg and a percent of the crop to put bees on their land. And commercial operations are flooding manuka areas, setting bees wherever they can find a spot, anywhere near manuka. This, of course reduces the crop for everybody, but at $20/lb, that's acceptable to big outfits, though little operations can't sustain themselves on that alone.

Hive theft has gained in popularity too, as has simple honey theft off the hives. Why steal bees when all you want is the honey? Only beekeepers steal hives.

And then there's Australia. And the New Zealand copyright on the name "Manuka Honey". Australia has manuka, too. Some say they had it first and it was transported to NZ, and of course now the courts are involved. I'm not sure where that will end up, but it won't be good for anybody I'd guess.

This has been compared to the California gold rush. Lots and lots and even more players are getting involved in keeping bees and harvesting what they hope is manuka honey. Players are hostile, and some dangerous, with equipment being destroyed or stolen, locations being squeezed by unfair competition… the list goes on. So who is making it in this gold rush? Well, those good folks selling beginner kits to new beekeepers and more equipment to existing beekeepers, security cameras to beekeepers with remote beeyards, farmers with manuka on their land, storage security units, special extracting equipment dealers and of course honey packers who buy this stuff. In the California rush, mostly the sellers of picks and shovels and food were the winners. Like this.

You can buy manuka honey today in the US. I got some +5 UMF (very weak) at Costco for just over $30 for a kilo, (2.2 lbs) and a 500 gram (22 oz) bottle of 10+ UMF for just over $40.

I've heard it'll cure anything but a broken heart.

•

If you haven't yet, take a look at the two honey reports this month. Even if you only have a single colony in the back yard the information on these reports will have an effect on what you can, can't and might do this season. We know that many backyard beekeepers never sell a jar of honey. It's simply a welcome benefit to having bees back there. We harvest it, bottle it and give it away to friends, family and neighbors. Maybe we sell a few to co-workers or friends who know the value of a pound jar of this stuff and insist they pay.

And many of us do sell but only at local venues – the farm market on Saturday, a nature center event once a summer, or a craft fair before the holidays. For those the wholesale price of honey in a barrel from India seems far, far away having no influence on your little business, but you would be wrong.

When honey prices are low, and they have been for several years now due to very, very inexpensive import prices, commercial beekeepers have to evaluate the costs of what they do. Are the costs of labor, equipment and debt worth the income from whatever honey nature allows them to make in a season? If they lose money on even a good honey crop, the probability of them not spending more money next season to lose more money again begins to increase. To the point of looking for other sources of income.

When the big guys quit buying bottles, extractors, uncappers and the like – when demand for those items declines – the supply dwindles and prices begin to increase. It's Econ 101 all over again.

If you're big enough to have product in a store somewhere, the people buying your honey look at a wholesale price of less than a buck from their store brand, and your price of over $3 and can make the same decision. They both sell, but they make a lot more on the imports than on yours. It's Math 101, all over again. So know the game you're playing in. The rules, the penalties and returns.

There are other consequences to the information on the report that have nothing to do with price however. And that's the bigger picture of where beekeepers are making money anymore. Pollination is now the star attraction, and honey is slowly sliding off the table. When you can't compete in a price war, but you are in the bee business, how do you stay there? Well, two things have happened that give an answer.

One of them is almonds. That chart from ERS explains it well, and almonds is the name of the game. They make up 82% of the fees paid to pollinators and 50% of all the acres pollinated for revenue. More importantly, pollination in general makes up 41% of all beekeeper revenue while honey this year made up 40%. It's not much of a difference, but it's the first time ever pollination has exceeded honey for money.

It will interesting to see what happens next year if China puts a hefty tariff or embargo on almonds this year. It's always something.

•

It's just about May when you get this but still early April when I'm writing it, and maple buds are just beginning to break. They're late. And the typical first lawn mowing is on the 15th, five days from now. No Way. And as of today we have two, count them, only two daffodils blooming. We planted over 100 last year, and have about that many from before. Two. You can hear the bees grumbling all the way from the back yard. Happy Spring. Keep your smoker lit, you'll need it to keep warm.

A Closer Look

Basic Honey Bee Biology

NEW!

X219

$15.00

www.beeculture.com

274 pages, color

Clarence H. Collison

It's Summers Time –

It is early April and in Northeast Ohio we are still waiting for even a hint of Spring. It snowed on my way to church yesterday. It's supposed to, maybe, possibly be in the low 70s this coming weekend. We, however will be in northern California where the weather is supposed to be about the same as here. Interesting, so far this year. What will Summer bring? Will Summer ever get here? I hope where you are you've had some Spring and a happy Easter and are getting those bees ready.

We've pretty much recovered and kind of caught up a little after our remarkable trip to New Zealand. I want to share just a little bit more about our trip with some photos. It was probably a once-in-a-lifetime trip. But you never know, given the opportunity we might go back again.

Our first day there inspite of our level of exhaustion we visited an aviary site where there were Kiwi birds. No pictures because they are nocturnal – I didn't know this. So you go into an almost completely dark room and can barely see them in a glass enclosure. They are bigger than I imagined.

At this same location they had eels – I know yuk! Kim took the opportunity to feed and pet them. Too creepy for me.

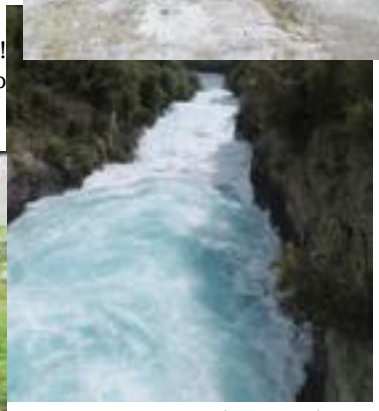
The same day we visited a cave which housed glowworms. I didn't know very much about them either. But seeing them was amazing. We walked through part of the cave and saw them hanging down from above – thousands of them with a sort of blue glow to them. Then we got in a boat and in the pitch dark made our way through the rest of the cave with again, thousands of these glowworms above us.

The next day we had a three-hour drive to our next location. If you are a *Lord Of The Rings* fan you know that a lot of the filming is done in New Zealand. As you're driving along you can see the terrain from the movies. It is not a heavily populated country and there are many miles of hills and valleys and fairly rough terrain. Most of the main roads are only two lanes.

Later in our stay we visited the area of Mirmar – yes as in the movie studio. This is where they do a lot of the computer generated parts of the movies. Besides *Lord of the Rings*, they also made *Avitar* there and many others.

Our third day brought another three-hour drive to the next spot working our way south. The folks that we stayed with there took us to a Maori village. This was one of the highlights for me – being able to learn more about this culture. Also, in this village were hot springs and boiling mud pits. Most of New Zealand we learned is volcanic and there is a lot geothermal activity that goes on there.

We stopped at a beautiful waterfall. And then to a hotel for a night that was right on the beach. It was beautiful.



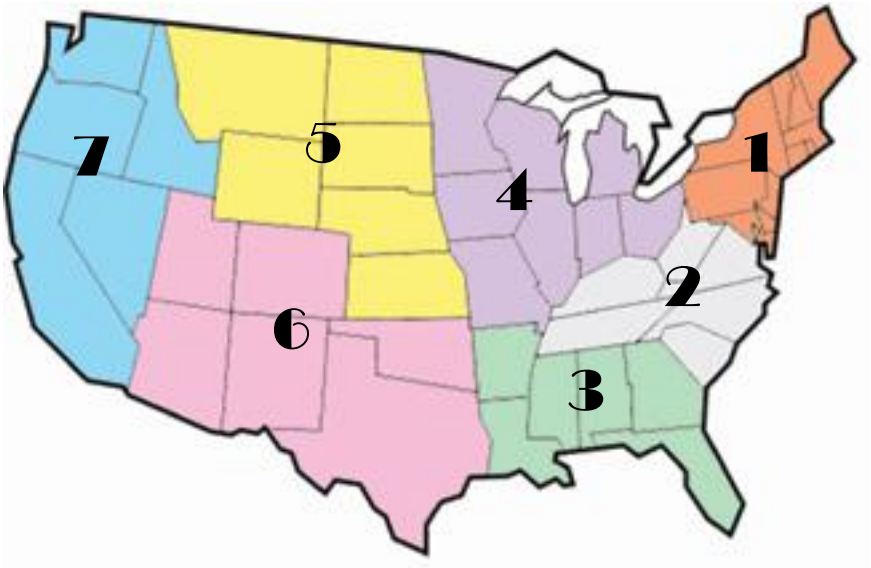
At each of these stops Kim gave one or two talks in the evening. Anywhere from 30 to about 75 people at each location. I think he gave eight talks in 10 days.

One of the most precious moments we had was seeing an old friend when we got to Wellington – Andrew Matheson. Kim met Andrew more than 20 years ago when Andrew visited the U.S. a couple of different times. He worked for IBRA for year and even though we haven't seen him in a very long time, he and Kim have always kept in touch.

These are just some of the highlights. There was so much more that we got to experience. I just want to thank everyone again who helped make this possible for Kim and I.

Just last week we had a comment from one of our subscribers regarding our publishing of articles that he felt aren't related strictly to beekeeping. He feels we should stick to beekeeping only. In the six years I've been writing this page about other topics – chickens, travels, gardening – I can honestly tell you we have had maybe a dozen people express their dislike of my page and also Jessica's page when she writes about the same topics. Instead we've had resounding positive comments. So to the gentleman who wrote us, please know that we try to please the majority. That's always been our goal. We're happy to receive your comments.

MAY – REGIONAL HONEY PRICE REPORT



Honey Market Prediction

Imports are still a challenge when it comes to honey prices (and honey quality), so we checked in with our reporters this month on their prices, the demand for their honey and what they intend to do this season because of all this.

It's about a 50:50 split on the demand side. About half expect it to increase, the rest to stay the same. That's over all. Regionally, it's way different in a couple of places. Region two has only 20% thinking demand will increase, and 80% staying flat, while Region 3 is just the opposite, with 77% aiming for an increase. The rest are about the same as the overall picture.

Honey prices aren't volatile in most places either. Overall, only 35% plan to increase prices this season, and 65% are going to stay the same. And that picture is pretty much the same everywhere. But for those who are raising prices, cost of production was by far the most common reason. But the simple fact that demand was increasing, especially in Regions 3 and 6, led reporters in those regions to take advantage of that and price increases will be seen more there. Interestingly, we offered another reason for raising prices, Because I Can, and 11% of the reporters will raise their prices because they can without hurting business.

So what about production plans next season? Overall, fully 60% plan some level of production increase to accommodate demand and need for increased income, even if prices stay flat, with Regions 3 and 5 leading the way for increases, and Regions 1, 2 and 9 avoiding that risk the greatest.

If you haven't already, take a look at the Annual Honey Report elsewhere in this issue. It is full of a lot of numbers that also help explain much of what our reporters are up against all of the time when it comes to marketing honey. We have been saying here for some time that the beekeeping industry is heading toward the business of pollination and making bees, and it hasn't backed off that move one bit since last year.

	REPORTING REGIONS							SUMMARY			History	
	1	2	3	4	5	6	7	Range	Avg.	$/lb	Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS												
55 Gal. Drum, Light	2.36	2.18	2.53	2.46	2.25	2.28	3.00	1.74-3.00	2.36	2.36	2.29	2.21
55 Gal. Drum, Ambr	2.20	2.13	2.14	2.39	2.20	2.15	3.00	1.35-3.00	2.22	2.22	2.19	2.10
60# Light (retail)	200.89	184.75	188.75	199.35	159.00	200.57	250.00	150.00-250.00	201.79	3.36	202.88	200.91
60# Amber (retail)	202.30	184.84	187.50	204.94	202.30	193.93	250.00	150.00-250.00	204.60	3.41	202.10	197.16
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	88.51	76.50	88.20	65.67	57.84	84.00	88.51	57.84-134.40	80.90	6.74	85.19	77.67
1# 24/case	137.93	108.70	130.76	113.11	127.16	124.88	172.00	86.40-211.20	127.06	5.29	124.55	118.50
2# 12/case	118.97	95.95	113.58	102.64	97.44	98.40	118.97	78.00-182.40	107.75	4.49	110.42	105.48
12.oz. Plas. 24/cs	107.83	89.60	100.67	87.00	74.40	104.32	84.00	66.00-172.80	96.27	5.35	98.57	92.91
5# 6/case	127.28	109.80	186.00	112.70	102.30	115.80	127.28	71.50-186.00	125.82	4.19	126.05	116.61
Quarts 12/case	161.72	138.04	133.26	163.25	155.32	130.62	132.00	109.00-250.00	143.93	4.00	141.78	140.01
Pints 12/case	92.35	91.40	76.33	81.00	111.00	81.96	84.00	65.00-126.00	89.19	4.96	91.65	89.98
RETAIL SHELF PRICES												
1/2#	4.64	4.30	4.70	4.12	3.97	3.68	6.00	2.36-7.00	4.60	9.19	4.86	4.24
12 oz. Plastic	5.93	5.09	5.21	5.22	4.76	6.50	5.10	3.50-9.00	5.61	7.47	5.78	5.32
1# Glass/Plastic	6.00	6.98	7.43	6.27	6.55	6.58	8.67	4.00-11.00	7.10	7.10	7.40	6.88
2# Glass/Plastic	12.00	10.51	12.84	10.57	11.62	11.00	15.00	8.00-19.00	12.05	6.03	12.47	11.90
Pint	11.10	8.89	9.14	13.14	8.90	10.69	9.47	4.50-20.00	9.95	6.63	10.08	9.65
Quart	16.54	15.80	17.17	15.15	15.90	17.10	19.04	8.00-25.00	16.58	5.53	17.10	16.35
5# Glass/Plastic	27.87	27.10	40.63	23.50	22.41	25.98	27.87	15.00-43.25	26.61	5.32	26.74	25.92
1# Cream	9.73	8.67	11.25	7.25	9.99	5.50	9.73	5.50-16.00	8.71	8.71	9.07	7.97
1# Cut Comb	11.82	10.00	11.75	9.56	12.50	6.50	11.82	6.00-20.00	10.64	10.64	11.48	10.63
Ross Round	9.00	6.59	9.00	9.00	9.00	10.50	12.49	6.00-12.49	8.75	11.67	8.27	8.75
Wholesale Wax (Lt)	7.73	4.96	5.75	5.91	6.00	5.55	8.83	2.75-15.00	6.58	-	6.41	5.82
Wholesale Wax (Dk)	6.31	4.84	4.18	5.89	6.31	3.17	5.50	2.00-12.00	5.62	-	5.64	5.60
Pollination Fee/Col.	102.50	69.00	72.50	82.50	102.50	142.50	75.00	40.00-195.00	87.50	-	89.58	87.50

U.S. Honey Industry Report – 2017

United States honey production in 2017 from producers with five or more colonies totaled 148 million pounds, down nine percent from 2016. There were 2.67 million colonies producing honey in 2017, down four percent from 2016.

Yield per colony averaged 55.3 pounds, down five percent from the 58.3 pounds in 2016. Colonies which produced honey in more than one State were counted in each State where the honey was produced. Therefore, at the United States level yield per colony may be understated, but total production would not be impacted. Colonies were not included if honey was not harvested. Producer honey stocks were 30.6 million pounds on December 15, 2017, down 26 percent from a year earlier. Stocks held by producers exclude the 2.8 million pounds, held under the commodity loan program.

United States honey production in 2017 from producers with less than five colonies totaled 599 thousand pounds, down 22 percent from 2016. There were 20 thousand colonies from which honey was harvested in 2017, down 17 percent from 2016. The average yield was 30.0 pounds per colony in 2017, down six percent from the previous year.

United States honey prices increased two percent during 2017 to 215.6 cents per pound, compared to 211.9 cents per pound in 2016. United States and State level prices reflect the portions of honey sold through cooperatives, private, and retail channels. Prices for each color class are derived by weighting the quantities sold for each marketing channel. Prices for the 2016 crop reflect honey sold in 2016 and 2017. Some 2016 crop honey was sold in 2017, which caused some revisions to the 2016 crop prices.

For operations with five or more colonies, the average prices paid in 2017 for honey bee queens, packages, and nucs were $14, $76, and $107 respectively. The average prices paid in 2017 for operations with less than five colonies were $34 per queen, $117 per package, and $138 per nuc. For operations with five or more colonies, pollination income for 2017 was $435 million, up 29 percent from 2016. Other income from honey bees for operations with five or more colonies in 2017 was $163 million, up 10 percent from 2016.

•

Well, the government has spoken, again, and their numbers look, actually, pretty encouraging all things considered. *Bee Culture*, if you recall, conducted a similar survey last November, using our Monthly Honey Report reporters. We've been doing that for some time and are usually close enough to the NASS numbers that we confidently make predictions that early. We missed it this year by quite a margin, but for a good reason. Our

Honey: Number of Colonies, Yield, Production, Stocks, Price, and Value by State and United States, 2017

State	Honey Producing Colonies[1]	Yield per Colony	Production	Stocks, Pounds Dec 15[2]	Average Price per Pound[3]	Value of Production[4]
	x1,000	Pounds	x1,000	x1,000	Cents	1,000 Dollars
AL	7	45	315	22	277	873
AZ	22	40	880	97	196	1,725
AR	29	77	2,233	223	191	4,265
CA	335	41	13,735	2,198	209	28,706
CO	33	43	1,419	284	206	2,923
FL	205	43	8,815	529	240	21,156
GA	99	32	3,168	190	296	9,377
HI	12	131	1,572	16	151	2,374
ID	95	44	4,180	1,045	179	7,482
IL	11	46	506	167	476	2,409
IN	7	48	336	128	394	1,324
IA	35	58	2,030	1,035	222	4,507
KS	7	79	553	260	418	2,312
KY	5	38	190	42	408	775
LA	43	81	3,483	279	188	6,548
ME	12	33	396	51	545	2,158
MI	87	45	3,915	822	241	9,435
MN	126	62	7,812	1,016	186	4,530
MS	13	80	1,040	83	181	1,882
MO	8	65	520	57	353	1,836
MT	145	72	10,440	2,506	230	24,012
NE	42	63	2,646	423	199	5,266
NJ	13	28	364	167	786	2,861
NY	57	56	3,192	766	301	9,608
NC	11	41	451	99	434	1,957
ND	455	74	33,670	4,377	189	63,636
OH	15	73	1,095	657	312	3,416
OR	78	40	3,120	998	189	5,897
PA	16	46	736	177	340	2,502
SC	16	34	544	27	306	1,665
SD	255	57	14,535	6,541	191	27,762
TN	7	41	287	75	468	1,343
TX	120	66	7,920	2,297	211	16,711
UT	27	31	837	67	206	1,724
VT	7	45	315	120	417	1,314
VA	5	35	175	39	573	1,003
WA	77	45	3,465	1,594	225	7,796
WV	6	40	240	50	385	924
WI	53	56	2,968	683	277	8,221
WY	39	53	2,067	186	159	3,287
Other States[5,6]	34	43	1,473	184	411	6,054
U.S.[6,7]	2,669	55.3	147,638	30,577	215.6	318,308

[1]Honey producing colonies are the maximum number of colonies from which honey was harvested during the year. It is possible to harvest honey from colonies which did not survive the entire year.
[2]Stocks held by producers.
[3]Average price per pound based on expanded sales.
[4]Value of production is equal to production multiplied by average price per pound.
[5]Alaska, Connecticut, Delaware, Maryland, Massachusetts, Nevada, New Hampshire, New Mexico, Oklahoma, and Rhode Island not published separately to avoid disclosing data for individual operations.
[6]Due to rounding, total colonies multiplied by total yield may not exactly equal production.
[7]U.S. value of production will not equal summation of States.

Honey Prices 1998-2017

Cents/lb.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
All Honey	60.1	59.7	70.4	132.7	138.7	108.5	90.4	104.2	103.2	141	144.5	160.3	172.9	195.1	212.6	216.1	209.0	207.5	215.6
Retail Shelf	126.6	130.4	142.2	152.5	188.5	188.7	183.3	191.0	196.1	197.6	278.4	305.4	328.4	340.5	373.5	406.6	409.6	462.	477.7
%Difference	53%	54%	51%	13%	26%	42%	51%	46%	29%	28%	48%	48%	48%	43%	43%	47%	51%	45%	45%

reporters gave us the number of colonies they had, and the number of colonies that produced honey. We projected that ratio onto the number of NASS colonies from 2016 to give us a working number of honey producing colonies in the U.S. for 2017. We also used the average pounds/colony number, 45, of our reporters and did the math for the number of colonies, and came up with a U.S. production for 2017 of 98.6 million pounds. That number came out to be two thirds of the NASS crop numbers. Why? We figured there would be 2.2 (as opposed to the 2.7) million colonies, each producing only 45 (as opposed to the 55) pounds each. We've been leaning in the direction that the number of beekeepers making honey as a first source of income, or even a second source are declining. Rather, they are concentrating on making bees, for other beekeepers who make honey or need more for pollination, or simply for themselves to increase their pollination capability, and thus income. The snap shot of colony and honey production on page 28 shows colony number remaining pretty steady for the past 25 years, while honey production has slowly, but steadily decreased during the same time frame.

What's also shown on the cost comparison chart on page xxxx is that the costs of keeping bees for commercial beekeepers continue to escalate, but that the prices for both honey and pollination have increased also. So, to make the same income, one could generalize, you don't have to make as much honey because you are getting paid more for it, and every colony you put into pollination earns more money each year. So a stable colony number keeps a beekeeper stable…certainly not rich, but at least breathing air.

A good picture of the pollination side of this is the ERS Infographic on page 28, showing the changes in income from pollination between 1988 and 2016. Without a doubt almond pollination has changed the picture completely, but look closely at the Total Farm Costs part of the picture. Pollination costs to both farmers, and consumers is, with the exception of almonds, less than 1%, and for almonds only 5%. And as far as affecting retail food costs – less than 1%. Yet without that service, there are no crops. Pollination has as much, or more value than water when it comes to growing food, yet do beekeepers, and their bees get as much credit, or cause as much grief as the lack of water? Not even close!

And look closely at the data at the top of the chart. Other income for beekeepers has dropped by half since 1988. Other income includes bees, beeswax and government payments. It doesn't break out the percent each of these represent which is unfortunate, but we suspect government payments is a chunk (there are, essentially no government payments anymore) of this. It would have been very revealing to see what percent of this income was do to sales of bees however, since we know that has increased.

The top 10 honey producing states have changed a bit this year. Idaho and Washington have joined the elite, while Michigan and Georgia have dropped off the list. North Dakota continues to dominate the scene in both production and colonies. In 2008 they had 400,000 colonies sitting there, and last year 455,000. Five states had a higher yield per colony as theirs was only 74 pounds each, but the huge number of colonies allowed them to produce 23% of the US honey crop last year. I had the opportunity to drive across North Dakota last summer during a cross country trip in kind of a hurry, and even from the vantage point of the freeway it was clear there are a lot of bees in that state. I heard that, if you chose your path carefully, you could walk across the state stepping only on beehives, and never touch the ground. I think they were right.

South Dakota came in a distant second, with just over half as many colonies, followed by California and Montana. The bottom six combined totaled less than North Dakota, but still were noteworthy compared to the rest of us.

With the exception of California (up 2.5 million pounds) and Minnesota (essentially flat), every one of

	2015		2016		2017	
	>5	5+	>5	5+	>5	5+
X1000 # Colonies	23	2.66	24	2.775	20	2.67
Yield/Colony #s	31.3	58.9	31.9	58.3	30	55.3
Production x1000 lbs.	720	156.5	766	161.9	599	147.6
Queen Costs	-	-	33	19	14	34
Pkg. Cost $	-	-	109	89	76	117
Nuc Cost $	-	-	122	117	107	138
Other Income x 1000	173	406.0	242	486.3	163.1	435
Varroa Control Cost/ Colony $	11.48	6.06	10.92	5.77	15.65	6.46
Workers x 1000	19	23	19	24	19	22
Feed Cost/Colony $	24.30	18.90	20.08	18.13	26.9	19.8

Top Ten Producing States Each Year

2011			2012			2013			2014			2015			2016			2017		
State	x1000 Col	x1000 Prod lbs	State	x1000 Col	x1000 Prod lbs	State	x1000 Col	x1000 Prod lbs	State	x1000 Col	x1000 Prod lbs	State	X1000 Col	X1000 Prod lbs	State	X1000 Col	X1000 Prod lbs	State	X1000 Col	X1000 Prod lbs
ND	460	32.6	ND	495	34.2	ND	480	33.2	ND	490	42.1	ND	490	36.2	ND	485	37.7	ND	455	33.7
CA	370	17.7	SD	270	17.0	MT	159	14.9	SD	230	24.4	SD	290	19.1	SD	280	19.9	SD	255	14.3
SD	250	16.5	FL	199	12.7	SD	265	14.8	FL	245	14.7	MT	146	12.1	MT	159	12.2	CA	335	13.7
MT	145	13.3	CA	340	11.9	FL	220	13.4	MT	162	14.3	FL	220	11.8	CA	310	11.2	MT	145	10.4
FL	180	10.9	MN	130	8.7	CA	330	10.8	CA	320	12.5	TX	126	8.3	FL	215	10.8	FL	205	8.8
MN	120	6.3	MT	149	7.7	MN	130	7.5	TX	116	9.0	MN	122	8.2	TX	133	9.3	TX	120	7.9
MI	74	4.7	TX	95	4.9	TX	106	6.2	MN	132	7.9	CA	275	8.2	MN	124	7.3	MN	126	7.8
TX	78	4.5	MI	76	4.3	LA	50	4.9	MI	91	5.7	MI	90	5.2	MI	89	5.3	ID	95	4.2
WI	57	3.6	WI	63	4.3	WI	59	3.5	GA	73	4.5	LA	44	4.3	LA	50	4.3	LA	43	3.5
GA	65	2.8	LA	41	3.5	GA	67	3.3	LA	48	4.0	NY	58	3.5	GA	96	3.7	WA	77	3.5
Total	1799	112.9		1858	109.1		1866	112.5		1957	139.1		1861	117.4		1941	121.8		1850	107.8
All Sts.	2491	148.4		2624	144.4		2640	149.5		2740	178.3		2660	156.5		2775	161.8		2669	147.6
% of Tot.	72.2%	76.1%		71%	76%		71%	75%		71%	78%		70%	75%		70%	75%		69	73%

Dadant

NOW OFFERING FREE SHIPPING *on purchases of $100 or more*

WOODENWARE

6-5/8 Hand Painted Painted Super

Comes assembled with 10 - 6-1/4" grooved top bar frames with beeswax coated Plasticell foundation installed in the frames. Commercial grade wood, hand painted so the hand holds are well coated.

9-5/8 Hand Painted Hive Body

Comes assembled with 10 - 9-1/8" grooved top bar frames with beeswax coated Plasticell foundation installed in the frames. Commercial grade wood, hand painted so the hand holds are well coated.

EVERYTHING FOR THE BEEKEEPER

STARTER KITS

Assembled 6 5/8" Expanding Apiary Kit C52501P

Assembled Starter Kit 10-frame C52201P

1-888-922-1293 www.dadant.com

We calculate the per capita consumption of honey each year using data from USDA NASS, USDA ERS, The Farm Service Agency and the US Census Bureau. Basically, we measure honey in (US production, imports, stocks used from the previous year), and we measure honey out (how much went into stocks, how much went under loan, exports). We calculate the difference and make somewhat of an assumption that the difference is what we consumed during the year. We then take that figure and divide it by the U.S. population, using the July 1 figure the Census Bureau provides each year and arrive at a pounds consumed per person.

Figures This Year For Honey In:

U.S. production – 147.6 million pounds (which includes all producers counted), plus imports of 447.6 (up 17% over last year) million pounds, plus stocks held over from 2015 of 41.3 million pounds, and there was no honey under loan from the previous year, for a total of 636.8 million pounds.

Figures This Year For Honey Out:

We exported 9.9 million pounds, stored 30.6 million pounds to be sold this calendar year and have three million pounds still under loan to be released later this year for a total of 43.5 million pounds.

U.S. population on July 1, 2016 was 323.1 million.

To calculate:

honey in = 596.2 million pounds
Honey out = 10 million pounds
Total consumption = 586.2 million pounds
U.S. Population July 1 = 328 million people

Per capita consumption = 1.79 pounds (28.6 ounces) of honey/person. This is up from the 1.61 pounds per person last year which is a good, and bad problem.

The good part of the problem is that people are consuming more honey. The bad part is that only 25% of that honey is produced in the U.S., or, looking at it another way, only 7.2 ounces of that, less than a half pound, came from here.

Per Capita honey consumption and the average price of all honey in the U.S. for the following years:

2010 – 1.20 pounds/person, @ $1.60/lb.
2011 – 1.27 pounds/person, @$1.73/lb.
2012 – 1.26 pounds/person, @$1.95/lb.
2013 – 1.44 pounds/person, @$2.13/lb.
2014 – 1.55 pounds/person, @$2.17/lb.
2015 – 1.51 pounds/person, @$2.09/lb.
2016 – 1.60 pounds/person, @$2.12/lb.
2017 – 1.83 pounds/person, @$2.16/lb.

Year	Million lbs honey in	million lbs honey out	million population	lbs/person
2010	398	29	307	1.20
2011	470	80	309	1.27
2012	487	53	312	1.26
2013	500	49	314	1.44
2014	547	56	318	1.55
2015	544	58	321	1.51
2016	573	55	323	1.62
2017	596	10	328	1.79

IMPORT AMOUNTS - %

	2016	2017
India	11.5	22.3
Vietnam	22.9	17.8
Argentina	20.1	17.4
Brazil	11.3	11.8
Ukraine	–	9.6
Canada	8.3	7.8
Mexico	2.3	2.3

Export History

Country	Millions/lbs 2014	Millions/lbs 2015	Millions/lbs 2016	Millions/lbs 2017
Vietnam	103.4	81.5	84.7	79.6
India	44.8	79.7	42.5	99.9
Argentina	81.2	59.6	75.9	77.9
Brazil	42.3	34.0	41.8	52.5
Mexico	16.4	11.2	10.3	10.3

Per Capita Consumption 2016

Snap Shot Of Colony & Honey Production

YEAR	COLONIES (x000)	PRODUCTION (000 lbs)
1993	2875	230.6
1994	2783	218.2
1995	2655	211.1
1996	2581	199.5
1997	2631	196.5
1998	2637	220.5
1999	2652	203.1
2000	2622	220.3
2001	2550	186.1
2002	2574	171.7
2003	2599	181.7
2004	2554	183.5
2005	2409	174.6
2006	2394	154.9
2007	2443	148.3
2008	2342	163.7
2009	2498	146.4
2010	2692	176.4
2011	2491	148.4
2012	2624	147.1
2013	2640	149.5
2014	2740	178.3
2015	2660	156.5
2016	2775	161.4
2017	2669	147.6

the top 10 states produced less honey this year than last, and combined produced only 73% of the U.S. crop, compared to the normal 75% or more.

Prices

The USDA Agricultural Marketing Service, AMS, produces a National Monthly Honey Report that provides information on colony conditions and local sales at the state level, and honey prices in volumes of 10,000 pounds for select states and markets. These are prices paid to beekeepers for extracted, unprocessed honey in major producing states by packers, handlers and other large users. The February issue is the one that has the data from all of 2017, plus January data from the U.S.,

and we use this data to report prices, and especially prices and amounts imported from every country that sells honey in the U.S.

The highest price paid in January to U.S. beekeepers was $2.40/lb for white California orange blossom. The lowest was $1.60 in several places for darker honeys. The highest price paid for imported honey (excluding organic) was $1.50/lb while the lowest was $.74/lb from Vietnam. Most imported honey was in the $1.00 - $$1.25 range, with a bit more paid for Canadian honeys.

This report also gives honey exported from the US to other countries. The Philippines, South Korea, Kuwait and Canada were the big leaders for exported U.S. honey last year, but in total, we exported 9.9 million pounds, or just about 7% of last year's total crop.

Considering the prices of imported honey it comes as no surprise that we import a great deal of honey from, we believe, any country that makes enough to fill a barrel. In total, we imported 447.8 million pounds, just over three times what we produced last year. Sixty seven percent of the honey consumed in the US last year was from off shore. That's compared to 369.3 million pounds imported last year, a 79 million pound difference.

The Honey Price By Color chart shows these differences dramatically, and over the span of the four most recent years.

Six countries, however, dominate the global export market. India leads the way with 22.3%, twice what they did in 2016, followed by Vietnam at 17.8% and Argentina at 17.4%. So just these three contributed 57% of all imported honey to the U.S. in 2017. The increase from India is interesting, though speculation about its true origin is only that.

It's unfortunate that there isn't easily accessible data on honey that is turned away due to adulteration with cheaper sweeteners, contamination with substances other than sweeteners, or is mislabeled from source. The TrueSouce Honey organization is in business to determine if honey labeled from a certain country is actually from that country, and their signature goes on every bottle that is inspected. But all of it isn't inspected so for at least some, it's a guess.

Summary

As data collection gets better, a more focused picture of our industry shows up. Adding to this is that the number of players in the commercial market is getting smaller as consolidation continues. Of course the number of backyard beekeepers continues to grow, but even that picture is changing. Varroa has made keeping bees alive more of a challenge, and shrinking habitat is adding to that challenge. And though pesticides are still an issue, they seem to be only in some locations, while others remain less affected.

That per capita consumption continues to climb each year is heartening. The one misleading fact in that is that it reports that every single one of our 326 million people are eating 29 ounces of honey in a year. And we all know that maybe half, maybe more of those peo-

Honey Price by Color Class - U.S.: 2014 - 2016
[Producers with 5 or more colonies that also qualify as a farm]

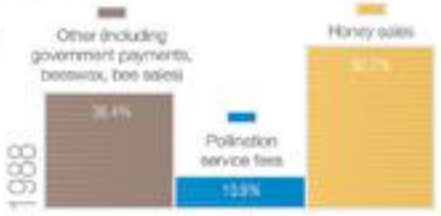
Color class	Price											
	Co-op and private				Retail				All			
	2014	2015	2016	2017	2014	2015	2016	2017	2014	2015	2016	2017
	cents per pound				cents per pound				cents per pound			
Water white, extra white, white	204.6	189.0	185.1	189.1	328.5	354.2	490.8	380.1	206.2	191.0	192.9	201.6
Extra light amber	209.6	204.0	187.7	190.8	392.2	411.8	377.5	458.8	218.3	215.4	195.1	213.5
Light amber, amber, dark amber	208.8	198.8	189.4	194.8	417.1	398.4	436.4	484.8	234.2	230.5	224.8	232.2
All other honey, area specialties	255.4	238.3	244.0	245.7	535.2	647.0	792.8	624.2	317.2	330.3	385.6	373.8
All honey	207.1	195.5	188.1	192	405.4	409.6	462.0	477.7	217.3	209.0	207.5	215.6

POLLINATION SERVICE FEES

While still a **small share** of food production costs, **pollination service fees** are now the **largest** source of **beekeeper revenue.**

SHARES OF BEEKEEPER REVENUE

In 1988, pollination service fees made up **11%** of beekeeper revenue

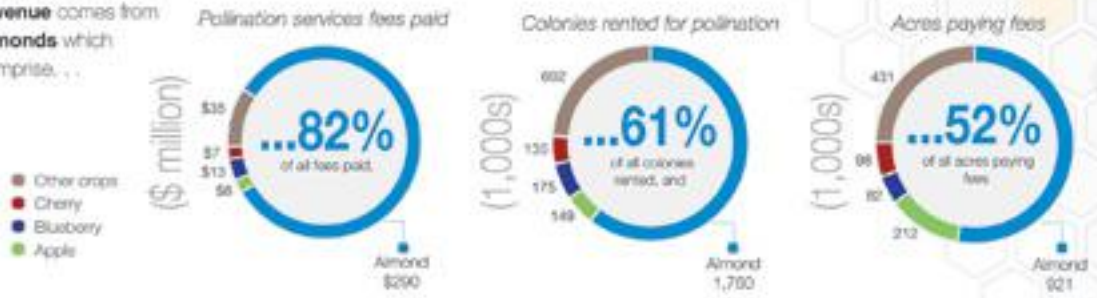


In 2016, they made up **41%** of revenue

Source: NASS Honey Report, 2017. Holt, F.L., and L.S. Willet, 1994 "The US Beekeeping Industry." USDA, Economic Research Service.

POLLINATION SERVICE REVENUE

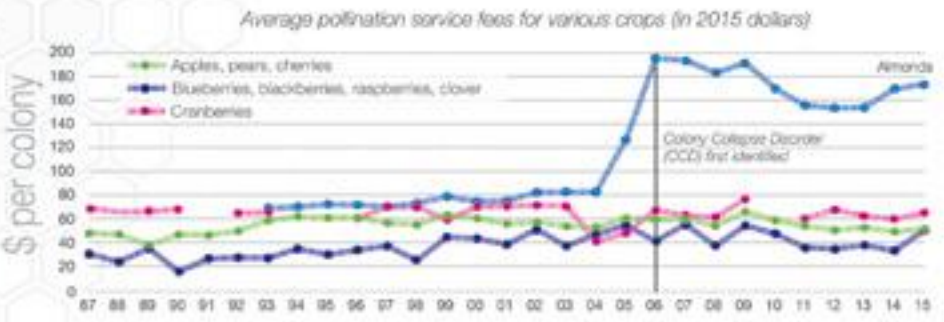
Most pollination service **revenue** comes from **almonds** which comprise. . .



Source: U.S. Department of Agriculture, National Agricultural Statistics Service (USDA-NASS), Cost of Pollination Report 2015.

POLLINATION SERVICE FEES

In 2015, pollination service fees were **3 times higher** for almonds than other crops.



Source: Survey of Beekeepers Based in the Pacific Northwest (Burgett et al., 2010, Caron, 2011, Segil and Caron, 2016).

TOTAL FARM COSTS

For most crops, pollination service fees made up **less than 5%** of total farm costs and **less than 1%** of retail food costs.

Source: USDA-NASS Cost of Pollination Survey, 2010. USDA-NASS Farm Production Data, 2015.

This article is drawn from...

Economic Effects of and Responses to Changing Honey Bee Health, by Peyton Ferrier, Randal Rucker, Walter Thurman and Michael Burgett, USDA, Economic Research Service.

The U.S. Beekeeping Industry, by Frederic L. Holt and Lois Willet, USDA, Economic Research Service, Report 660, 1994.

Additional sources:

Burgett, M., S. Debenkow, and R. Rucker. 2010. "U.S. Pollination Markets: Recent Changes and Historical Perspective." *American Bee Journal* January 2010.

Caron, D.M. 2011. "Bee Colony Pollination rental prices, eastern US with comparison to west coast."

Segil, R., and D. Caron. 2016. "Honey Bee Pollination in the Pacific Northwest." *American Bee Journal* 156(7).

United States Department of Agriculture
Economic Research Service

Heard the Buzz?

For more information on our publications visit our ONLINE CATALOGS at **http://bit.ly/2jsHIHp**

Get the new 4th edition of The Backyard Beekeeper by Kim Flottum from Bee Culture magazine

Backyard Beekeeper, 4th edition
Kim Flottum
ISBN: 9781631593321
Paperback, 240 pages
$24.99 US/$32.99 CAN

The Complete Guide to Making Mead
Steve Piatz
ISBN: 9780760345641
Paperback • 160 pages
$24.99 US/$27.99 CAN

Pollinator Friendly Gardening
Rhonda Fleming Hayes
ISBN: 9780760349137
Paperback • 176 pages
$21.99 US/$25.99 CAN

Beekeeper's Lab
Kim Lehman
ISBN: 9781631592683
Paperback • 144 Pages
$24.99 US/$32.99 CAN

Beeswax Alchemy
Petra Ahnert
ISBN: 9781592539796
Flexibound • 136 pages
$25.00 US/$28.00 CAN

The Beekeeper's Problem Solver
James E. Tew
ISBN: 9781631590351
Paperback • 224 pages
$19.99 US/$21.99 CAN

Good Garden Bugs
Mary M. Gardiner, Ph.D.
ISBN: 9781592539093
Flexibound • 176 pages
$24.99 US/$27.99 CAN

Bee Friendly Garden
Doug Purdie
ISBN: 9781743367575
Paperback, 224 pages
$28.99 US/$37.99 CAN

Bees
Sam Droege
ISBN: 9780760347386
Hardcover • 160 pages
$25.00 US/$28.00 CAN
Available July 2015

The Backyard Beekeeper's Honey Handbook
Kim Flottum
ISBN: 9780785829171
Hardcover • 168 Pages
$12.99 US/$14.99 CAN

The Beekeeper's Journalv
Kim Flottum
ISBN: 9781592538874
Hardcover • 176 pages
$17.99/$19.99 CAN

The Beginner's Guide to Beekeeping
Daniel Johnson and Samantha Johnson
ISBN: 9780760344477
Flexibound • 176 pages
$19.99/$21.99 CAN

Egg to Bee
Camilla de la Bedoyere
ISBN: 9781609920500
Hardcover • 24 pages
$15.99 US/$17.99 CAN

Better Beekeeping
Kim Flottum
ISBN: 9781592536528
Paperback • 176 pages
$24.99 US/$27.99 CAN

Bee Manual
Claire Waring
ISBN: 9780857338099
Hardcover • 192 pages
$36.95/$40.95 CAN

What On Earth?: Bees
Andrea Quigley
ISBN: 9781682971499
Hardcover • 64 Pages
$12.95 US/$16.95 CAN

The Quarto Group

FOUND IN TRANSLATION

Over In Winter

Jay **Evans**, USDA Beltsville Bee Lab

I don't want to dwell on loss for a second month, but there are increasingly good studies recently that take the long view on what causes colonies to fail between Fall and Spring. Such colonies are in good company. In the U.S. and many temperate countries, overwinter losses remain stubbornly high. There must be an explanation there, or perhaps several. As the lab fundholder, it pains me that even here we have to shell out for packages every Spring (and I LIKE the guy we get packages from).

As with other times of year, unwarranted Winter losses (e.g., colonies that went into Winter with sufficient stores and numbers to have a chance of surviving) likely reflect a mix of stresses. Marco Beyer and colleagues describe their search for the most important of those stresses in an upcoming paper from *Research in Veterinary Science* (**https://doi.org/10.1016/j.rvsc.2018.01.012**). By diligently following hives via repeated surveys across four years (1364 'hive-years' in total) they were able to tease apart trends related to both mite treatment strategies and climate. Interestingly, both this study and the Austrian study by Matthew Switanek and colleagues I highlighted last Spring (**http://dx.doi.org/10.1016/j.scitotenv.2016.11.178**), found that warm Winters correlate with higher Winter losses. Whether that is due to maladaptive choices by queens or workers, a failure to recluster in cold snaps, or a more favorable environment for pests and parasites is unclear. Whatever the proximate cause, the impacts of warm Winters were fairly sudden. Both studies found that warm December and January temperatures were a solid predictor of colony death the very same Winter. In addition, both studies showed believable trends between inopportune rainfall and colony losses (e.g., rainy July's led to higher colony losses while rainy Septembers favored colony overwinter survival.

Lest this seem like a slam dunk for the effects of climate on overwintering success, the authors found that mite treatment regimes by surveyed beekeepers had an equally large impact on overwinter losses. In particular, they identified a strong difference in overwintering success based on the strength of formic acid used to treat colonies.

Colonies receiving a 60% formic acid treatment tended to fare poorly in this survey while those given a greater mite shock (85% formic acid) survived much better. Unfortunately, they do not couple this observation with data on actual mite loads, and they make clear that the weaker formic treatments might have been applied differently, but on the whole the differences were striking. The next strongest predictor of high colony survivorship came for beekeepers using oxalic acid midwinter, although this by itself was not enough to significantly decrease losses.

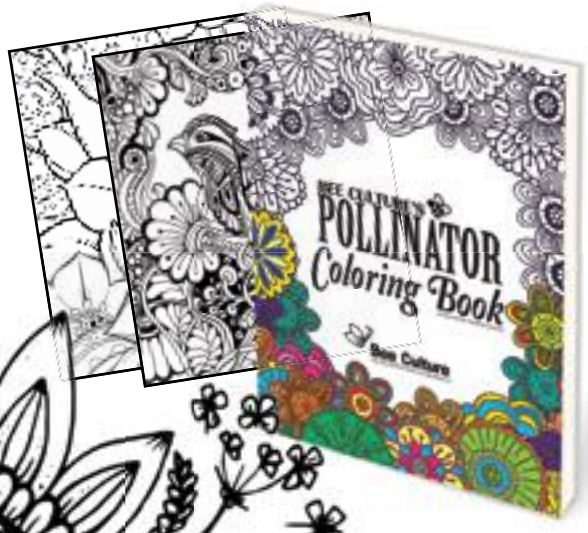
In another fresh paper from the *Journal of Apicultural Research*, Philip Brown and colleagues attempt to determine drivers of colony loss in New Zealand (**https://doi.org/10.1016/j.rvsc.2018.01.012**). Thanks perhaps to the allure of pricey honey, New Zealand colony levels have tripled in the past 10 years and are six times higher than they were in the 1940s a sharp contrast with the U.S. where bee numbers have declined substantially in that same time frame. Another reason for the great interest in beekeeping there might be that New Zealanders have not full met the heartache of loss, with average loss rates near ten percent (sigh). *Varroa* and *Nosema ceranae* are features on both of the major New Zealand islands but seem not to have the same impacts yet. In fact, on the side of arthropod pests, key threats identified in the study included wasps and an aphid! (ok, not the world's first bee-attacking aphid but the giant willow aphid which, true to its name, damages an important pollen source).

Back to the Northern hemisphere, expanding data coming from the Bee Informed Partnership continues to

show a connection between mite control or the lack thereof with both overwinter and yearly losses. The always-improving survey app at **https://bip2.beeinformed.org/survey/** takes the work out of pouring over their growing treasure trove of data. As in past years, mite treatments, and amitraz in particular, are tied with better fates. Interestingly, only 25/234 respondents who were commercial beekeepers did NOT use amitraz in 2016 and 2017 combined, but for those 25, loss rates were equal to those using amitraz. All other classes of beekeepers showed significantly higher losses if they skipped using amitraz. Solid surveys from the equally stricken (> 30% losses) Netherlands also show mites to be the greatest factor, with pesticides in honey and the presence of canola pollen skating into the silver and bronze spots. Romée van der Zee (e.g., **e0131611. doi:10.1371/journal.pone.0131611**) continues to rally good survey numbers in that country, as part of the global Colony Loss Network (**www.coloss.org**).

So, how can these survey results help you? For one, they are only strong when everyone takes part, so be sure to reply (in the U.S.) to both the BIP survey and the USDA's National Agricultural Statistics Service survey on colony health. And keep perusing their results to compare with your own experience. The results are free and continue to provide good insights into managing bees. You can't change the weather (as individuals), but you can react to it smartly and there are other risks that are more easily addressed. BC

Bee Culture's
Pollinator Coloring Book



$15.00

X218 – Visit www.beeculture.com

24 8½" x 11" pages to color and design. Birds, bats, bees, butterflies, flowers, dragonflies and more. Heavy Duty, non-bleed paper.

Bee Culture
The Magazine Of American Beekeeping

A Closer LOOK

WAGGLE DANCES

Clarence **Collison**

Little is known about how waggle dance followers are able to read the waggle dance in the darkness of the hive.

Honey bees communicate to nestmates locations of resources, including food, water, tree resin (propolis) and nest sites, by making waggle dances. Dances are composed of repeated waggle runs, which encode the distance and direction vector from the hive or swarm to the resource. Distance is encoded in the duration of the waggle run, and direction is encoded in the angle of the dancer's body relative to vertical (Schürch et al. 2013).

The waggle dance can be regarded as a repetition of movements consisting of a waggle "run" and a return run. During the waggle run, the dancer swings her body from side to side in a pendulum-like manner, 13-15 times per second, and she produces dance sounds by vibrating her wings dorsoventrally (Wenner 1962). The bee moves her body continuously forward, but her legs do not move at all or perform only a few slow-motion strides (Tautz et al. 1996). In the return run, the dancer circles back to start a new sequence. Some parameters of the waggle run are correlated with the location of the advertized feeding site. The angle between the sun's azimuth and the direction to food in the field equals the angle between gravity and waggle run, which is called waggle run angle. The distance to the food source is indicated in the duration of the waggle run: the longer the duration of the waggle run, the further away is the feeding site (von Frisch 1967). Dance followers mostly accompany the dancing bee. The interaction between dancers and dance followers can be broken up into the following successive steps: First, bees motivated to follow a dancer detect, localize and approach the dancer (Tautz and Rohrseitz 1998). Second, they accompany her, often for many circuits (Esch and Bastian 1970), and thus become dance followers. Third, after following a number of dances, they often fly out and find the indicated food source.

Little is known about how waggle dance followers are able to read the waggle dance in the darkness of the hive. Initial observations showed that not all of the bees that appear to be dance followers behave the same. Some bees maneuver themselves behind the dancer, while others do not. The paths of a single dancer, trained to an artificial food source, and her followers were traced during the waggle runs. The success of these dance followers was compared to their position relative to the dancer. The results of this study show that during a waggle run a dance follower must position itself within a 30º arc behind the dancer in order to obtain the dance information. The results suggest that bees are using the position of their own bodies to determine direction (Judd 1994).

The behavior of bees surrounding a dancing bee was studied, using two colonies in observation hives in a shaded part of an apiary. Video recordings and macrophotography were used to view an area of the dance field. Two distinct behaviors were recognized: that of followers and that of attendants. The attendants stood around the dance field with their antennae stretched towards the dancer, and only occasionally moved with the dancer. Followers continuously ran with the dancer, keeping their heads within the border of the dancer's figure-eight paths at all times. The angle between the body of the follower and that of the dancer was 90º during most of the dance, except at the exit of the waggle run. At that time the follower had to cross over to the opposite side of the dancer. The distance between the head of the follower and the dancer's body was nearly always smaller (1,758 cases out of a total of 1,882) than the length of an extended antenna. During the return run the follower touched the dancer with antennae most of the time, whereas during the waggle run the followers intermittently touched the dancer. Either one bee (81 % of cases) or two bees (18%) followed the dance simultaneously. The second follower and all other bees were usually pushed out of the follower's position because of a lack of space at the inner side of the dancer (Božič and Valenlinčič 1991).

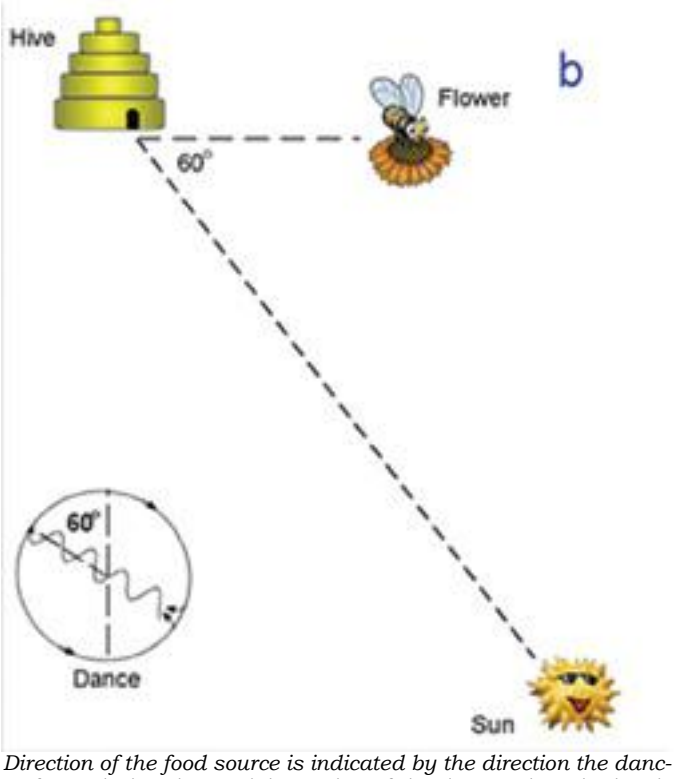
Biesmeijer and Seeley (2005) studied the extent to which worker honey bees acquire information from waggle dances throughout their careers as foragers. Small groups of foragers were monitored from time of orientation flights to time of death and all in-hive behaviors relating to foraging were recorded. In the context of a novice forager finding her first food source, 60% of the bees relied, at least in part, on acquiring information from

waggle dances (being recruited) rather than searching independently (scouting). In the context of an experienced forager whose foraging has been interrupted, 37% of the time the bees resumed foraging by following waggle dances (being reactivated) rather than examining the food source on their own (inspecting). And in the context of an experienced forager engaged in foraging, 17% of the time the bees initiated a foraging trip by following a waggle dance. Such dance following was observed much more often after an unsuccessful than after a successful foraging trip. Successful foragers often followed dances just briefly; perhaps to confirm that the kind of flowers they had been visiting were still yielding forage. Overall, waggle dance following for food discovery accounted for 12-25% of all interactions with dancers (9% by novice foragers and 3-16% by experienced foragers) whereas dance following for reactivation and confirmation accounted for the other 75-88% (26% for reactivation and 49-62% for confirmation). They concluded that foragers make extensive use of the waggle dance not only to start work at new, unfamiliar food sources but also to resume work at old, familiar food sources.

The behavior of 38 honey bee dance followers and the patterns of antennal contact between followers and dancer were monitored during ten waggle runs for a feeding site 1200 meters from the hive. The analysis was restricted to waggle runs with a maximum of five followers, allowing the followers to choose between different positions around the dancer. At the beginning of the waggle run, followers are rather evenly spaced around the dancer. During the waggle run, the followers tend to accumulate at the rear end of the dancer. At the end of the waggle run, all followers are found in a ±60° arc behind the dancer. The body orientation angles of the followers depend on their position relative to the dancer. The follower bees have intense antennal contact with the dancer. At least one temporal parameter of the contact pattern may inform the followers about their position relative to the dancer, may guide the dance followers to the rear end of the dancer and may allow them to extract information about the location of the food source advertised by the dance. The role of antennal contact for dance communication appears to have been underestimated in previous studies (Rohrseitz and Tautz 1999).

Tautz (1996) reported that the nature of the floor on which the bees dance has considerable influence on the recruitment of nestmates to a food source. Dancers on combs with open empty cells recruit three times as many nestmates to a food source as dancers on capped brood cells.

Honey bee foragers can follow waggle dances (social information) to obtain vector information about the location of profitable food sources or they can use route memories (private information) acquired during previous foraging trips. The relative use of social information versus private information is poorly understood. It is hypothesized that social information should be prioritized when the use of private information has a low benefit. Grüter and Ratnieks (2011) tested this hypothesis by training foragers to a high-quality 2 M sucrose feeder, which subsequently became unrewarding. As foragers continued to experience zero reward from their private route information they increased the time spent following waggle dances advertising an alternative food source with the same odor. A significant proportion of foragers successfully switched to the food source indicated by dances. Overall, trained foragers showed a strong attachment to the known but currently unrewarding feeder, even after repeatedly following dances advertising a profitable alternative. Successful recruits to the novel food source advertised by the waggle dances had more social information about this source in that they had followed dances for longer. Their results suggest that honey bee foragers follow a strategy that is conservative in terms of switching from one food patch to another.



Direction of the food source is indicated by the direction the dancer faces during the straight portion of the dance when the bee is waggling. If she waggles while facing straight upward, than the food source may be found in the direction of the sun.

Hydrocarbons emitted by waggle-dancing honey bees are known to reactivate experienced foragers to visit known food sources. Gilley (2014) investigated whether these hydrocarbons also increase waggle-dance recruitment by observing recruitment and dancing behavior when the dance compounds are introduced into the hive. If the hydrocarbons emitted by waggle-dancing bees affect the recruitment of foragers to a food source, then the number of recruits arriving at a food source should be greater after introduction of dance compounds versus a pure-solvent control. This prediction was supported by the results of experiments in which recruits were captured at a feeder following introduction of dance compounds into a hive. This study also tested two nonexclusive behavioral mechanism(s) by which the compounds might stimulate recruitment; 1) increased recruitment could occur by means of increasing the recruitment effectiveness of each dance and/or 2) increased recruitment could occur by increasing the intensity of waggle-dancing. These hypotheses were tested

by examining video records of the dancing and recruitment behavior of individually marked bees following dance compound introduction. Comparisons of numbers of dance followers and numbers of recruits per dance and waggle run showed no significant differences between dance compound and solvent-control introduction, thus providing no support for the first hypothesis. Comparison of the number of waggle-dance bouts and the number of waggle runs revealed significantly more dancing during morning dance-compound introduction than morning solvent-control introduction, supporting the second hypothesis. These results suggest that the waggle-dance hydrocarbons play an important role in honey bee foraging recruitment by stimulating foragers to perform waggle dances following periods of inactivity.

Thom et al. (2007) used solid-phase microextraction and gas chromatography coupled with mass spectrometry to show that waggle-dancing bees produce and release two alkanes, tricosane and pentacosane, and two alkenes, Z-(9)-tricosene and Z-(9)-pentacosene, onto their abdomens and into the air. Non-dancing foragers returning from the same food source produce these substances in only minute quantities. Injection of the scent significantly affects worker behavior by increasing the number of bees that exit the hive. The results of this study suggest that these compounds are semiochemicals involved in worker recruitment. By showing that honey bee waggle dancers produce and release behaviorally active chemicals, this study reveals a new dimension in the organization of honey bee foraging.

From the honey bee dances, human observers can read the distance and direction of the food source. When foragers collect food in a short, narrow tunnel, they dance as if the food source were much farther away. Dancers gauge distance by retinal image flow on the way to their destination. Their visually driven odometer misreads distance because the close tunnel walls increase optic flow. Esch et al. (2001) examined how hive mates interpret these dances. They were able to show that recruited bees search outside in the direction of the tunnel at exaggerated distances and not inside the tunnel where the foragers come from. Thus, dances must convey information about the direction of the food source and the total amount of image motion en route to the food source, but they do not convey information about absolute distances. They also found that perceived distances on various outdoor routes from the same hive could be considerably different. Navigational errors are avoided as recruits and dancers tend to fly in the same direction. Reported racial differences in honey bee dances (von Frisch 1967) could have arisen merely from differences in the environments in which these bees flew.

The sound and air flows generated during the waggle dance by the dancer's wing and abdominal vibrations have been implicated as important cues for the bees following the dancer. To understand the neural mechanisms of honey bee dance communication, Tsujiuchi et al. 2007, analyzed the anatomy of the antenna and Johnston's organ (JO) in the pedicel of the antenna, as well as the mechanical and neural response characteristics of antenna and JO to acoustic stimuli, respectively. The honey bee JO consists of about 300-320 scolopidia (fundamental unit of a mechanoreceptor organ in insects, sensitive to sound (vibrations of the air) or substrate vibrations) connected with about 48 cuticular "knobs" around the circumference of the pedicel. Each scolopidium contains bipolar sensory neurons with both type I and II cilia. These neurons convert mechanical vibrations into a nerve impulse. The mechanical sensitivities of the antennal flagellum (antennal segments beyond the second segment) are specifically high in response to low but not high intensity stimuli of 265-350 Hz frequencies (Hz = hertz, one vibration cycle/second). The honey bee flagellum is a sensitive movement detector responding to 20 nm tip displacement. Furthermore, the JO neurons have the ability to preserve both frequency and temporal information of acoustic stimuli including the "waggle dance" sound. Intriguingly, the response of JO neurons was found to be age-dependent, demonstrating that the dance communication is only possible between aged foragers. These results suggest that the matured honey bee antennae and JO neurons are best tuned to detect 250-300 Hz sound generated during the "waggle dance" from the distance found in a dark hive, and that sufficient responses of the JO neurons are obtained by reducing the mechanical sensitivity of the flagellum in a near-field of dancer.

Hydrocarbons emitted by waggle-dancing honey bees are known to reactivate experienced foragers to visit known food sources.

Waggle-dancing honey bees produce vibratory movements that may facilitate communication by indicating the location of the waggle dancer. However, an important component of these vibrations has never been previously detected in the comb. Nieh and Tautz (2000) developed a method of fine-scale behavioral analysis that allowed them to analyze separately comb vibrations near a honey bee waggle dancer during the waggle and return phases of her dance. They simultaneously recorded honey bee waggle dances using digital video and laser-Doppler vibrometry and performed a behavior-locked Fast Fourier Transform analysis on the substratum vibrations. This analysis revealed significantly higher-amplitude 200-300 Hz vibrations during the waggle phase than during the return phase. They found no significant differences in the flanking frequency regions between 100-200 Hz and 300-400 Hz. They recorded peak waggle phase vibrations from 206 to 292 Hz with a mean of 244 Hz. Therefore, the dance followers likely obtain cues from both sound and substrate vibrations. BC

References

Biesmeijer, J.C. and T.D, Seeley 2005. *The use of waggle dance information by honey bees throughout their foraging careers.* Behav. Ecol. Sociobiol. 59: 133-142.

Božič, J. and T. Valentinčič 1991. *Attendants and followers of honey bee waggle dances.* J. Apic. Res. 30: 125-131.

Esch, H. and J.A. Bastian 1970. *How do newly recruited honeybees approach a food site?* Z. Vergl. Physiol. 68: 175-181.

Esch, H.E., S. Zhang, M.V. Srinivasan and J. Tautz 2001. *Honeybee dances communicate distances measured by optic*

flow. Nature 411: 581-583.

Gilley, D.C. 2014. *Hydrocarbons emitted by waggle-dancing honey bees increase forager recruitment by stimulating dancing.* PLoS ONE 9(8):e105671. doi:10.1371/journal.pone.0105671.

Grüter, C. and F.L.W. Ratnieks 2011. *Honeybee foragers increase the use of waggle dance information when private information becomes unrewarding.* Anim. Behav. 81: 949-954.

Judd, T.M. 1994. *The waggle dance of the honey bee: Which bees following a dancer successfully acquire the information?* J. Insect Behav. 8: 343-354.

Nieh, J.C. and J. Tautz 2000. *Behaviour-locked signal analysis reveals weak 200-300 Hz comb vibrations during the honeybee waggle dance.* J. Exp. Biol. 203: 1573-1579.

Rohrseitz, K. and J. Tautz 1999. *Honey bee dance communication: waggle run direction coded in antennal contacts?* J. Comp. Physiol. A 184: 463-470.

Schürch, R., M.J. Couvillon, D.D.R. Burns, K. Tasman, D. Waxman and F.L.W. Ratnieks 2013. *Incorporating variability in honey bee waggle dance decoding improves the mapping of communicated resource locations.* J. Comp. Physiol. A 199: 1143-1152.

Tautz, J. 1996. *Honeybee waggle dance: recruitment success depends on the dance floor.* J. Exp. Biol. 199: 1375-1381.

Tautz, J. and K. Rohrseitz 1998. *What attracts honeybees to a waggle dancer?* J. Comp. Physiol. A 183: 661-667.

Tautz, J., K. Rohrseitz and D.C. Sandeman 1996. *One-strided waggle dancer in bees.* Nature 382: 32.

Thom, C., D.C. Gilley, J. Hooper and H.E. Esch 2007. *The scent of the waggle dance.* PLoS Biol. 5(9):e228.doi:10.1371/journal.pbio.0050228.

Tsujiuchi, S., E. Sivan-Loukianova, D.F. Eberl, Y. Kitagawa and T. Kadowaki 2007. *Dynamic range compression in the honey bee auditory system toward waggle dance sounds.* PLoS ONE 2(2):e234 **doi:org/10.1371/journal.pome.0000234**.

von Frisch, K. 1967. *The Dance Language And Orientation Of Bees*, Harvard University Press, Cambridge, MA., 566 pp.

Wenner, A.M. 1962. Sound production during the waggle dance of the honey bee. Anim. Behav. 10: 79-95.

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

The Sanctuary

Early in life, by the time I was, say, 10, I had already learned celebrity isn't all it's cracked up to be. Beside the middle aisle on the second pew is where I grew up, with a congregation full of people looking on behind, with my mom enforcing stillness, and my dad behind the pulpit proclaiming the gospel to his flock. Sitting there I was close as anyone, save my dad up there preaching, could be to the center of attention. I guess somewhere along the line I began to associate the eyeballs behind me, and people in general, with pressure and expectations.

By teenage years, my mom had relented and allowed me to sit on my own. I chose the balcony, safe from prying eyes. Perhaps that was the beginning of a lifetime of trying to avoid the notice of humans – and the pressure associated with it. Oh, to be John the Baptist (minus the head on a platter), a man of the wilderness who ate locust and honey. As a child I had perfected the art of catching locusts, or crickets and grasshoppers, not for my own consumption, but for the bass and bream I hoped to catch. Crawling, I would stalk, cup my hand, and pounce. Time spent alone catching crickets was time spent in the present, with no self-consciousness, no need to please people. Besides crickets I would hunt lizards and frogs and toads. I would upend rocks looking for bizarre centipedes and millipedes and carefully jar black widows. Eventually, I would enter forestry school, hoping to become that man of the wilderness, to lead a life dealing more with trees and creatures than people.

Why do you keep bees? Or, why do you continue to keep bees? I wonder if you can trace it back to something in childhood. Many people start beekeeping, like I eventually would, to help save them. But I don't continue to keep bees because I want to save them. If that was the case, I would have given up long ago. Beekeeping, to me, is a more acceptable adult version of catching crickets. I can't shake it, you see, trying to be acceptable. A grown man on his hands and knees stalking around tall grass trying to capture insects for fun is, I think, strange behavior for my in-laws who inhabit the land around us. Beekeeping, on the other hand, is a solitary pursuit with insects that is more acceptable, especially if tributes of honey jars earn good graces.

At church (on the back pew nowadays), I often find my mind drifting back to the beeyard where I work my hives every Sunday afternoon. Stinging insects in general scare people away, which is fine by me. Thus, the beeyard is a sanctuary with no expectations. It has humble pews made of 2 x 6s laid across concrete blocks. The other parishioners usually take no notice of me when I sit beside them, watching them come and go into the heavens. A field rat lives under one pew and scurries away into the blackberry thicket whenever I approach to have a sit. I suppose it, too, finds the gaze of man uncomfortable. When I don a white robe of sorts, I forget whatever I'm inwardly dwelling on and lose myself (and often my hive tool) while working bees. And sometimes I talk to myself, the bees, or Someone unseen. BC

Stephen **Bishop**

Electronic Record Keeping — The Path To Better Beekeeping

Joseph **Cazier**

Introduction

Last month (April 2018 Issue), I wrote an article for *Bee Culture* outlining the path to what I called the *Genius Hive*. You might recall that while a *Smart Hive* is a hive that can tell you about itself (weight, temperature, humidity, etc.) a *Genius Hive* is one that can tell you what it needs to do better. It might include treatments, feedings, space, genetic selection of a queen best suited to a given area, and an alert system when a problem arises.

As outlined in last month's article, the path to building a genius hive, or *Intelligent Apiary Management System,* involved several steps. The first step was the collection of large scale data in a format that could be analyzed with advanced analytical techniques, such as *Machine Learning* and *Data Mining.* These tools help develop algorithms to integrate best management practices into software that can assist beekeepers to better manage their hives for optimal performance.

However, all of this presupposes that you have data to analyze. In a survey we discussed last month, 74% of respondents reported that they kept no paper records when doing routine management tasks, such as inspecting a hive. To build a genius hive, we would need not only good records, but those records would need to be standardized (everyone entering similar data for similar things) and those records would need to be entered in or converted to an electronic format that could then be analyzed.

Since electronic record collection is so critical to the use of *Data Science* to lead to better beekeeping, and good records are currently so few and far between, the focus of this article will be on why beekeepers should move from paper or spreadsheet or no records to electronic recordkeeping.

The Case for Records

There are many good reasons for beekeepers to keep good records, even independent of the *Genius Hive*. Better records lead to better beekeeping. The late Peter Drucker, one of the most famous management gurus of the 20th century, promoted the axiom "what gets measured gets managed"[1], which has become one of the most well recognized business quotes of our age.

Research and experience also support this axiom. In fact, it was the premise for starting our recordkeeping platform for beekeepers, *HiveTracks.com,* when my friend James Wilkes, a computer science professor and sideline beekeeper, started *Hive*

[1]Larry Prusak "What Can't Be Measured" Harvard Business Review, October 10, 2010.

Tracks in 2010 with the motto *Know Your Bees.*

If you don't know your bees, how can you manage them effectively? For beekeepers, better records (measures) can lead to better outcomes in several ways. Some of them are obvious, others less so. Here are a few of the obvious ones:

- *Best Management Practices* – Recording management actions and treatments to avoid redundancy or missing a necessary action.
- *Personalized Hive Management* – Remembering how the colony was doing at a given time to see changes in state or to identify the best queen from which to split a colony and to learn what works with your bees in your area.
- *Business Management* – Understanding revenue and expenses for your operations and other factors to optimize profit and productivity.
- *Research* – Keeping quality and consistent records. A hallmark of good science for generations, good records help us learn valuable information about bees and beekeeping, especially when combined with other data and when available at scale.
- *Documentation* – Keeping records for legal or regulatory concerns for government or other reporting requirements. Other times, we might need good records to settle insurance or legal claims.

In the next section we will explore a framework for better understanding the promise that good digital recordkeeping has to offer by looking at the *Information Systems Lifecycle.*

The Information Systems Lifecycle

The field of *Information Systems* is about the collection, storage, and processing of information, which is based in part on good records. Most of these activities are done today using electronic records stored on digital media or in the cloud.

To help us better understand and explain how information moves through an organization, let's explore the concept of the *Information Systems Lifecycle,* which was conceptualized and developed by Rick Watson[2], a professor at the University of Georgia, and adapted by Gabriele Piccoli[3] for use here as presented in Figure 1. Let's take a moment to understand this framework; then we can explore how it can help us better understand the proper role of records in beekeeping.

The key to this framework is to think through the various ways that good data and recordkeeping can help us in our beekeeping operations. This framework starts with the concept of *Remembering the Past.* This is the fundamental role of an information system, upon which all other roles are built. Often this data is recorded in a Transaction Process System (TPS), but it can be saved in other ways too, such as when customers enter hive inspection data in the Hive Tracks platform.

Figure 1. *The Information Systems Livecycle*

Remembering the past can be an end in itself, but its key value is in what it can do next: that is to help you *prepare for the future.* The data collected from the past can be analyzed and categorized in a way that can help you prepare for events that are likely to reoccur. Then when these events arrive, you are better able to *handle the present* or deal with the current situation in an optimal way, which includes looking for new ways to do well in the future (soon to be present) by finding new opportunities to create value.

The ability to predict and prepare for the future is often done through analytics and is one of the reasons that data science is a career in high demand now, ranked the best job in the U.S. for the last three years in a row[4]. Once the present becomes the past, the transactions or records are recorded and become part of remembering the past; as the cycle renews itself, we look for ways to use the past to plan for the future and act on that future as it becomes the present.

Why This Matters to Beekeepers

If it is true, as our survey suggests, that most beekeepers do not consistently keep good records of their beekeeping operations, treatments, inspections, and outcomes, then beekeepers have the most to gain from adopting a good recordkeeping system. This is even more true if this system can be used to prepare for future events, find new opportunities, and optimize the present situation they face.

[2]Watson, Richard, T. "Data Management: Foundations of Data Analytics", eGreen Press; 6th edition (December 27, 2013).

[3]Piccoli, Gabriele "The Business Value of Customer Data: Prioritizing Decisions", The Cutter Edge, Vol 5 No. 10 (October 1, 2005)

[4]Hess, Abigail "The 10 best jobs in America according to Glassdoor" CNBC, January 24, 2018, **https://www.cnbc.com/2018/01/23/the-10-best-jobs-in-america-according-to-glassdoor.html**

Let's take a look at a few examples to see if we can better illustrate the point. We will do this by looking at possible uses of the Information Systems Lifecycle in bee health, honey sales, and pollination services to improve beekeeping operations.

Bee Health

Imagine beekeeper Ben. An accountant by training, Ben is a meticulous record keeper and this carries over to his beekeeping operation. He is using an electronic information system to track his operation and records all of his hive observations. He knows when he has treated his bees, installed a new queen, and recorded the source and its genetics to the best of his ability. Furthermore, Ben anonymously contributes his data to an international data repository that blends his information together with that of tens of thousands of other beekeepers.

This data is then analyzed by teams of researchers and data scientists who share those insights with Ben. Through this insight, Ben knows that his bees have a higher chance of suffering from a given health threat than normal. He also knows that, given the conditions his bees are in now, their microclimate, and the genetic strain of his queen, management action X is more likely to save his bees than management action Y.

Ben has remembered the past, then used that past information to prepare for the future. Now when the future becomes the present, Ben can use this information to take better care of his bees by using management plan X instead of management option Y. This data, along with the outcomes of those actions, is then recorded and fed back into the Information System Lifecycle. Thus, the feedback and knowledge to prepare for the future and optimize the present gets better every season as more information is collected and processed.

Honey Sales

Beekeeper Angie likes to sell her honey at the local farmers market, and also maintains a website selling her rare varietal flavors to those who have acquired the taste for them, but live in different areas of the country. A marketer by training, Angie keeps good records of all of her sales and services. She also tracks all of her customer contacts and knows when she last followed up with them and what they purchased when.

Because she remembers the past, Angie takes some time in the off season to better understand each of her local and distant customers. She uses this information to do an RFM analysis of all her customers and varietal sales. An RFM Analysis is a business intelligence concept that identifies and ranks each customer based on the ***R****ecency,* ***F****requency, and* ***M****onetary* value of their purchases.

Those customers who have purchased more recently are more likely to purchase again in the future, as are more frequent customers, and of course she wants to pay attention to those who have spent more money with her. By knowing her customers, she now plans out her season on how to best serve them by identifying which varietals are likely to be in the most demand and where. She then comes up with a marketing plan to maximize revenue, price, and profit, and another plan to improve her varietal mix based on market conditions.

Later, when the day has arrived, she uses this information to handle the present. She reaches out to her best customers for each varietal, lines up her orders, knows the ideal price for each, and manages her colonies to produce the most profitable mix of honey for her local and online businesses by targeting her inventory to the most profitable markets. As such, she experiences a 20% increase in profitability and continues to grow her business as this year's data feeds into the next cycle.

Pollination Services

Sullivan is a young aspiring commercial beekeeper eager to build and grow his business and make a mark on the world. He is fluent with new technologies, having grown up in a tech savvy era and technologically literate family. He is eager to see how electronic recordkeeping can help his pollination and honey-producing business. Sullivan invests in remote sensors for a portion of his hives to

monitor what is going on in his yards. He also uses a standard rubric to record all of his hive observations and inspections so his data can scale.

This recordkeeping gives him a good comparison year-over-year, and allows him to pool key data with other beekeepers (anonymously, if desired), so that more data is collected and remembered in different settings at different times. As a result, it creates a way to monitor regional and national trends and send alerts when there might be some kind of trouble with a hive. This is especially important for a migratory beekeeper as he moves his hives across the country and his bees face different threats in different climates with different levels of health challenges (poor nutrition, parasites, pathogens, pesticides). The data pooling service helps him identify threats in each area he plans to visit so he can prepare.

All of this data and analysis helps him prepare for the future. Then when the future arrives and becomes the present and he moves his bees on the pollination circuit, he can remotely monitor which hives are in trouble and predict, in advance, where the trouble spots are likely to be and take preemptive action to avoid or minimize the danger to his operation.

Since he also monitors crop yields from past pollination activity (from data he collects from his customers at the end of the growing season) and correlates it with his services, weather, and other agricultural inputs, he is better able to time his pollination services (based on current data tied to historical outcomes) to the needs of the farmer and optimize his own time in each field, arriving just before the bloom and staying until the data assures that optimal pollination has been achieved.

These activities are done in conjunction with the farmer as they both monitor bee activity through sensors and weather data correlated to pollination needs and know when enough flight hours have been reached. This saves him time and allows him to charge more for his pollination services as he and the farmer both know with certainty what service was provided and can rest assured as to the pollination impact on the crop, thereby increasing profits for both Sullivan and the farmer.

There is another key benefit. Since he keeps good records, and the service he uses records this data using blockchain technology, which provides mathematical proof of inputs, outputs, and management activities (more on this in a future article), he is able to insure his bees at very good rates because the insurance company has access to all the data it needs to verify his losses (if he has any). The data is so secure that payments happen automatically when there is a loss, helping keep his operation solvent in times of need. Likewise, the farmer gets better insurance rates on the crop by having proof of optimal pollination and can set up automatic payment on the blockchain once the contract is fulfilled to the agreed upon terms.

Preparing for our Future

The goal of this article was to make the case for keeping good electronic records and pooling at least some of that data in the short and long term to allow for better decisions concerning our beekeeping operations. Hopefully, looking at the *Information Systems Lifecycle* and a few plausible future implementations is helpful in understanding the importance of collecting and sharing data so we can use the best that technology and data science has to offer to help our operations not only survive but thrive in the future.

Good records help all of us. They help the beekeepers run better operations and, when quality-consistent data is pooled together, it can help all of us manage our bees and pollinator activities better. This is a critical and necessary step to building an Intelligent Apiary Management System (Genius Hive). We are trying to make it easier for beekeepers to do this through our *Hive Tracks* platform, but whatever the method, please consider the important role that recordkeeping plays in helping all of us save the bees and ensure optimal hive management.

Finally, special thanks to *Project Apis m.* for supporting a portion of this work with a Healthy Hives 2020 grant and to *Bee Culture* for providing a venue to share these ideas with an interested audience. BC

Special thanks to James Wilkes, Ph.D, for his helpful comments in writing this article and Wendy Winn for technical editing.

Joseph Cazier is the Chief Analytics Officer for HiveTracks.com and the Director of the Center for Analytics Research and Education at Appalachian State University. He spends his days thinking about ways to use analytics for good and then finding ways to do them. You can reach him at ***joseph@hivetracks.com***

When I first thought of writing about honey bee vision, the painted hive fronts of Slovenia seemed a good place to start. These elaborate panels of folk art and lore grace the fronts of hives which are stacked tall and wide on the south facing side of traditional Alpine bee houses. The elaborate houses are fully enclosed by walls on the other three sides, but the hives constitute the fourth wall, with all the entrances facing the same way.

In the early days, Slovenian hives were simply long shallow boxes, not very wide, but all stackable, both in the bee houses and on horse drawn wagons which were used to transport them from winter to summer pasturage. As modern beekeepers, we can see how the bees might be confused by being placed so close together, since honey bees are prone to "drifting," or wandering into the neighbor's place. Beekeepers today often paint their hives different colors to try to distinguish one from another.

But what do the bees make of all of this? Certainly they don't distinguish between a scene of a beekeeper chasing a bear versus a woman sharpening her tongue on a grinding wheel. But maybe they see shapes, colors, and patterns. Sometimes traditional wisdom is based upon experience – learning by doing. So imagine my surprise when I learned the real reason the hives are painted so fancifully.

In Central Europe, during the 1700s and 1800s, people began to acquire wealth and wanted a simple and obvious way to display it. They began to decorate their furniture, possessions and even the fronts of their houses. Beekeeping was well developed and prosperous in Slovenia, and a large, well stocked bee house was a sure sign of prosperity (Beehive 1983). Hence, the tradition of painting hive fronts is a bit of ostentation on the part of the beekeepers, and perhaps means nothing at all to the bees. It wasn't to help bees "recognize" their hives, but that folks should "recognize" their owners!

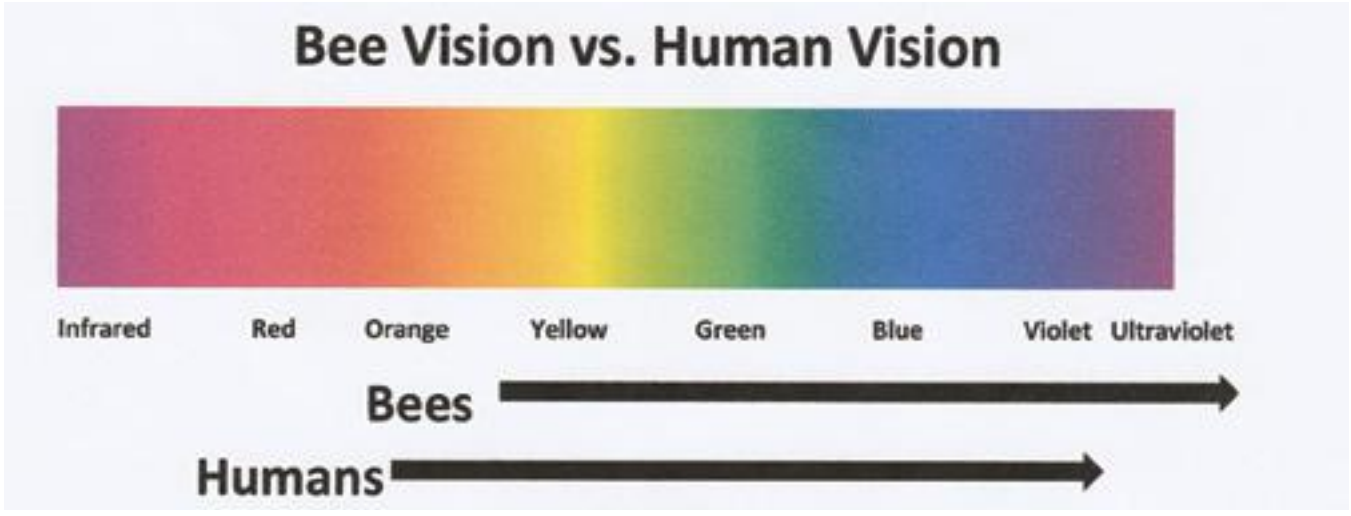
While the tradition of decorated hive fronts waned during the 20th century, the habit of painting hive fronts distinct colors has not. A typical bee house will display hives colored yellow, blue, red, white, green – even lavender and so forth. But do bees really distinguish these colors at all? What do honey bees see?

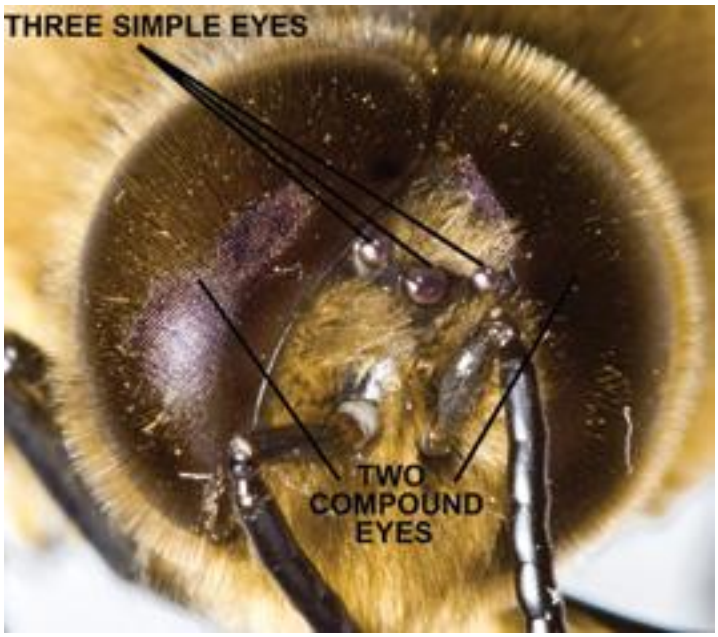
> *The Eyesight of bees, notwithstanding the wonderful mechanism of their eyes, seems less perfect than their other senses: on some occasions it scarcely serves them to distinguish the entrance of their hives, when they come home loaded with provision. Wildman thought they saw better when flying than when on foot. I believe, however, that this opinion of Wildman, will not, upon examination, be found quite correct. The mere act of flying does not enable them to see objects better (Bevan 1827).*

Bevan sensed that the visual acuity of honey bees is significantly less than ours, but he was wrong about the benefit of flight. Since the bees are moving, they are made capable of judging distances, which is so much more difficult from a stationary position.

Sense of Place

Very early on it was noticed that honey bees have a memory for place. If a hive is moved a short distance they fly home from the field expecting to find it, and seem to not notice it by its appearance but rather they remember where it was. Perhaps this is because appearances in nature tend to change, especially during the growing season when bare branches become leafy, and grass and weeds shoot up many feet skyward. Whereas, if the bees can locate by dead reckoning, they are more apt





to get home successfully. Early writers showed their understanding of this:

> *If we follow the little laborer during its excursions in the fields, in search for honey, we see it proceed from flower to flower with as much precision, as though this organ existed in its utmost perfection. And when it has gathered its little load, it rises in the air, and as true as the needle to the pole, it makes its way straight homewards, as if in full view of the hive. But let the hive be moved only a few inches to the right or left, or let the entrance be partially closed or turned around only one inch or two, from the place it formerly occupied, the bee appears not to notice this in the least, but flies with unerring precision to that point on the alighting board, formerly occupied by the door of the hive, and after several fruitless attempts to find the entrance, it rises again into the air, as it would appear, for the purpose of removing at such distance from the hive as is best suited to the focus of its visual organ (Phelps 1858).*

These writers had little to help them other than their powers of reasoning, to imagine what the bee's eye view of the world might be. Upon the discovery of the microscope, investigators found the compound eyes of insects to be radically different from the eyes of animals and humans. Our eye has a single lens, and can be focused by the eye muscles. The lens projects the image onto the retina, where it is converted to nervous impulses. In the insect, we find thousands of tiny lenses.

Putting it into Focus

The pioneer Leewenhoeck used his primitive microscope to look through one of these lenses and reportedly observed an entire church steeple, which appeared upside down, like an image on our own retina does. Obviously, the brain or nervous system "corrects" the image and what we see rightly reflects reality. But even then, it was obvious that this contrivance – the compound eye – was less adequate for fine grained viewing:

> *It is evident, therefore, that no composite eye of practicable dimension, acting as supposed above, could be made to give definition even approaching that of the human eye. The eyes would give a picture about as good as if executed in rather coarse wool-work and viewed at a distance of a foot; and, although a distant landscape could only be indifferently represented on such a coarse-grained structure, it would do very well for things near enough to occupy a considerable part of the field of view (Mallock, 1894).*

This view was particularly insightful but not completely accurate. In subsequent decades discoveries showed that honey bees have excellent tools for navigation at a distance, and lack of visual acuity is not really an impairment to this. I have at hand an exceptional book published in 1953 by C. R. Ribbands, a researcher at Rothamsted Experimental Station. It covers the range of bee behavior; I quote this excerpt from Chapter Two, on Vision.

> *The honey bee is usually considered to be short-sighted, but this is a misinterpretation. The insect eye possesses no focusing mechanism; short-sightedness is a derangement of focusing ability, which can only occur in eyes with focusing arrangements, so the honeybee is not short-sighted in the sense in which we use the term among ourselves. Its indistinct vision, due to lack of acuteness, applies at all ranges. The definition of an object falls off as the distance between object and eye increases, just as it does in the human eye.*

The Work of von Frisch

At about the same time, Karl von Frisch issued his monumental work *Bees: Their Vision, Chemical Senses, and Language,* published in 1950. The first chapter covers "The Color Sense of Bees," to which I already alluded. Von Frisch points out that flowers with bright colors tend to attract pollinators, so this is a clue as to what these insects are able to see (of course, there are many other attractions, including scents, and nectar rewards, but I deal here with sight).

The color sense of bees had been investigated by John Lubbock, an English scientist working in the second half of the 19th century. He used the technique of placing honey on colored paper, and showed that bees associate color with reward. Through extensive experimentation, he concluded the bees' favorite color was blue (Lubbock 1882).

Von Frisch pointed out merely recognizing a particular shade, alone can't prove color sense because color blind people can see differences in brightness. So, he placed a blue card among gray cards of all shades of gray, ranging from white to black. In this manner, he was able to delineate what colors bees can actually recognize. In his words:

> *Training bees to come to food on orange, yellow, green, violet, or purple cardboard gives a positive result. However, if we try to train bees to find their food on scarlet red, they alight not only on the red cardboard but also on black and on all the dark-gray cards in our arrangement. Thus red and black are the same to the eye of the bee; in other words, bees are red-blind.*

Von Frisch mentions that scarlet red flowers are rarely found in Europe, while they are far more common in Africa and the Americas. However, these larger flowers are generally visited by birds, which are highly attracted by bright reds. Further experiments led to the discovery that while honey bees do not perceive red, they can see ultra-violet light. Their vision is shifted on the spectrum. This accounts for why bees are attracted to poppies, which appear bright red to us. They reflect brightly the ultra-violet rays and that is what the bees see. Also, the poppy is a good source of pollen.

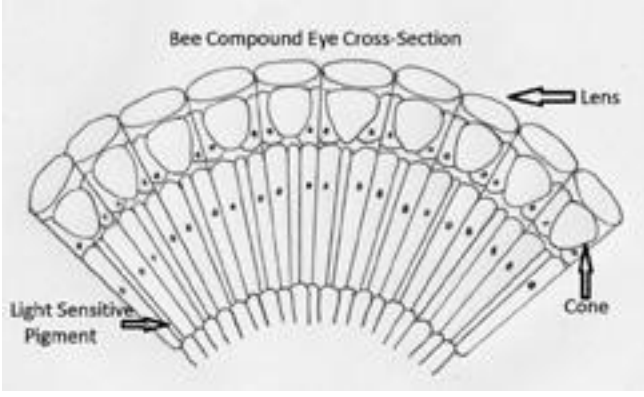
Celestial Navigation

One of the foremost researchers in the field, Mandyam Srinivasan, plainly states: "The worker honey bee, by virtue of its lifestyle, is a spectacularly suitable organism for studying fundamental principles of color vision, pattern recognition, learning and memory, flight control, and navigation" (Srinivasan 1998). So then, how do bees travel many miles from home to specific locations, and how do they get back? Essential to the answer is an understanding of polarized light.

The light from the sun radiates in all directions, but as it passes through our atmosphere it takes on a direction which is called polarity. While it was first described in 1871, it wasn't until 1950 that a full analysis was presented. The observed polarity of light is the result of the position of the sun in the sky, the position of the observer, and the direction of observation. Polarity reflects where the sun is and my direction compared to it. If it's afternoon and the sun is on my left, I am headed north (in the northern hemisphere).

A honey bee's ability to see polarized light gives it a keen sense of direction. Using it, the bee can communicate to other bees where a patch of flowers can be found, by the famous bee dance. This dance uses the angle between the sun's current position and the destination, to indicate in which direction a recruit should fly. How far they should fly is encoded in another way altogether. As von Frisch tells it:

> *The distance is indicated in a rather exact manner by the number of turns in the wagging dance that are made in a given time. At 100 meters there were 9 to 10 complete cycles of the dance within 15 seconds; at 200 meters there were 7; at 1 kilometer, 4; and at 6 kilometers, only 2. If we know this relation between rate of turning and distance to the food, we can tell by means of a stop watch about how far a dancing bee has flown (von Frisch 1950).*



by dancing more slowly; the dance speed is the inverse of the distance. But that leads us to the most interesting question, how do they tell how far they went? Early on, researchers proposed that bees equate distance with energy expended, -- like how far you can go on a tank of gas. But given factors like wind and hills, fuel consumption is seldom constant.

Tunnel Vision

This inquiry led to a series of experiments, carried out in the 1980s, by Mandyam Srinivasan. The researchers supposed that flying bees receive information on either side of them, as they flew through a landscape, and judge distance based on the rate which they pass landmarks. In the experiment, they trained bees to fly through a short tunnel with vertical black and white stripes on either side of them. The top was clear, enabling the investigators to observe and film the bees flying through the tunnel.

> *Groups of four - six freely flying honey bees (*Apis mellifera*) were marked and trained to receive a food reward at an apparatus which offered sugar solution at the end of a tunnel formed by two walls 40 cm long, 20 cm high, and 12 cm apart. Each wall carried a pattern consisting of a vertical black and white grating with a spatial period of 3.5 cm (Kirchner 1989).*

Bees have two eyes but do not use stereo vision to judge distance. Rather, they orient themselves by keeping the rate at which the landscape appears to be moving on either side of them. The investigators verified this by designing a tunnel in which the pattern could actually be moved, and the bees responded accordingly:

> *When the grating was moved at a constant speed in the direction of the bees' flight – thereby reducing the velocity of retinal image motion on that eye relative to the other eye - the bees' trajectories shifted toward the side of the moving grating.*

They were fooled into misjudging the distance; it was perceived as further away than it actually was. This work was groundbreaking at the time, but it has since been investigated much more deeply. Not only that, but the discoveries made relating to insects were quickly applied to the field of robotics. Srinivasan, *et al.*, published *Robot navigation inspired by principles of insect vision* in 1998, followed in 2009 by *Flying Insects and Robots.*

Play Flights

The honey bee is often given as an example of elaborate behavior, skill and ability that is present upon birth. They instinctively "know" how to do a range of things, from comb building and house keeping, to caring for the developing larvae that result from the queen's egg laying activity. On the other hand, they need to learn a lot, very quickly. Beekeepers for centuries have observed honey bees embarking on their first "play flights." This activity often occurs on pleasant afternoons, when larger numbers of young bees undertake orientation.

Certainly, they are forming a memory of the appearance of the hive as they sally to and fro, but more importantly, they are establishing its location related to the environment. Where is the sun at that time of day? Later, they may fly toward it (direction) for a specified

amount of time (distance) and will be able to return, using the information they gathered going forth.

I used to imagine honey bees have a map in their little memories, since I have always collected maps and are very fond of them. In fact, I was very reluctant to make the switch from map navigation to GPS, and I still prefer to look at maps when planning a route. However, the beauty of GPS navigation is that it requires far less information than is found in a visually based map. One does not need to know all the hills and valleys to get from here to there, just the optimal route. Keep it simple, just the most important details are needed. This connects with the discussion of robotic flight:

> *Landmark-based goal navigation in honey bees is explained as an emergent property of basic visuomotor reflexes, which are modified by a continuous learning process. Relatively unstructured, search-like flights are observed in bees with limited experience with the landmark setting. Control strategies based on a flexible and adaptable employment of basic control loops may also be suited for MAVs [autonomous micro-air vehicles] with limited storage and processing capacity to enable successful landmark navigation (Floreano 2009).*

What it is Like to Be a Bee

Many years have passed since Thomas Nagel's 1974 article "What Is It Like to Be a Bat?" in which he used the example of the bat's primary system of navigation, echo location, to show how we could never really know what it is "like to be a bat." This inspired a revolution in the study of animal consciousness, led by people such as Donald R. Griffin. Griffin argued that Nagel used a poor example to begin with, since echo location (SONAR) has been exploited by humans so we do know what that is like. Even blind human beings are able to use sound to advantage (Griffin 2001).

But beyond that, by studying how animals in general, and particularly honey bees, Griffin showed that we can understand how they process the world and how they communicate with each other. In fact, researchers Couvillon and Ratnieks, working in England, observed the honey bee dances in several colonies over the entire season and were able to generate maps of the places where they most frequently foraged. It turns out they went most often to natural preserves and far less often to organically farmed lands. They were able to generate maps, which could be used to support the continued financing of preserves, not only for bees but beneficial insects in general.

As beekeepers know, a worker bee's life is short and whatever she learns dies with her. But the overlap of workers means that some information is retained by the colony. Honey bees can live from fall to spring and retain memories of places they visited the previous season, such as water sources. In this way, the knowledge of landscape features is maintained over time. Vision and memory are crucial to the success of the honey bee colony.

Endnotes

If this brief glimpse sparked your curiosity, hunt down the monumental work by Adrian Horridge, titled *What Does the Honeybee See? and How Do We Know?* (available free online). Another line of inquiry, which I just touched upon, is the learning and memory of the colony. See the recent work by Stephen C. Pratt and Takao Sasaki on "The Psychology of Superorganisms." BC

References

Beehive paintings from Slovenia: loan exhibition from the Slovenian Ethnographic Museum, Ljubljana. (1983). Horniman Museum, London.

Bevan, E. (1827). *The Honey Bee: Its Natural History. Physiology, and Management.* London: John Van Voorst.

Couvillon, M. J., Schürch, R., & Ratnieks, F. L. (2014). Dancing bees communicate a foraging preference for rural lands in high-level agri-environment schemes. *Current Biology*, *24*(11), 1212-1215.

Floreano, D., Zufferey, J. C., Srinivasan, M. V., & Ellington, C. (Eds.). (2009). *Flying insects and robots.* Heidelberg: Springer.

Griffin, D. R. (2001). *Animal Minds: Beyond Cognition to Consciousness.* University of Chicago Press.

Horridge, A. (2009). *What does the honeybee see? And how do we know?: A critique of scientific reason.* ANU E Press. **http://press-files.anu.edu.au/downloads/press/p11351/pdf/prelims6.pdf**

Kirchner, W. H., & Srinivasan, M. V. (1989). Freely flying honeybees use image motion to estimate object distance. *Naturwissenschaften*, *76*(6), 281-282.

Lubbock J. (1882) *Ants, Bees and Wasps: A Record of Observations on the Habits of the Social Hymenoptera.* Keegan Paul, Trench, Trübner, & Co. Ltd., London: 442 pp.

Mallock, A. (1894). I. Insect sight and the defining power of composite eyes. *Proceedings of the Royal Society of London*, 55(331-335), 85-90.

Phelps, E. W. (1856). *Phelps' Bee-keeper's Chart: Being a Brief Practical Treatise on the Instinct, Habits and Management of the Honey-bee, in All Its Various Branches.* CM Saxton.

Ribbands, C. R. (1953). *The behaviour and social life of honeybees.* Bee Research Association Limited.; London.

Sasaki, T., & Pratt, S. C. (2018). The Psychology of Superorganisms: Collective Decision Making by Insect Societies. *Annual review of entomology*, *63*.

Srinivasan, M. V., Chahl, J. S., Weber, K., Venkatesh, S., Zhang, S. W., & Nagle, M. G. (1998). Robot navigation inspired by principles of insect vision. In *Field and Service Robotics* (pp. 12-16). Springer, London

Von Frisch, K. (1950). *Bees: their vision, chemical senses, and language.* Cornell University Press.

Easy Hive Monitoring

Phil **Craft**

With all the challenges facing honey bees and beekeepers today, *Varroa* mites are still the greatest threat. Last month, in my *Ask Phil* column, I answered a question about *why* monitoring for mites is so important. This month I am devoting an entire article to how it's done and specifically how to use the *Varroa* Easy Check, made by Véto-pharma, to monitor more simply and accurately.

About Véto-pharma: Véto-pharma is a honey bee pharmacological company headquartered in Paris, France. It is best known as the maker of Apivar, the only amitraz based *Varroa* control product registered for use in the United States. It also distributes ApiLifeVar (a thymol based miticide), HiveAlive (a feed enhancer for honey bees), and *Varroa* Easy Check. Those products, and others, are distributed worldwide, in 35 countries. *(Full disclosure: I work part time for Véto-pharma as the company's U.S. technical consultant.)*

***Varroa*:** Remember, the purpose of monitoring is not to determine whether or not your hives contain mites; they do. All hives in this country do. The purpose is to provide a snapshot of how many mites are present on the bees at a given time, and how dangerous the level of infestation is. As much as 70% of a colony's *Varroa* population can be present unseen in a colony's brood cells. After a worker or drone egg laid by a queen bee hatches, an adult female *Varroa* enters the cell and lays her own eggs. As the immature bee develops, the newly hatched *Varroa* mites develop faster and begin feeding, first on the larval bee and then on the pupa. When the young bee emerges from the cell, the female mites – already mature and mated – leave also, looking for a suitable place to begin the cycle again in a brood cell. Both in brood cells and on adults, mites feed on the bees, weakening them and spreading viruses and other diseases in the process.

Monitoring: When we monitor, we are not actually sampling the number of *Varroa* mites in the colony, but only those on the adult bees, technically called phoretic mites. We express these numbers as percentages – ratios of mites found per 100 adult bees. Through research and observation of colony dynamics, scientists have developed thresholds, short for *Varroa* control thresholds. A mite count percentage below the threshold is considered acceptable; one at or above it indicates the need for some form of mite treatment. It's a laudable attempt to help beekeepers quantify their level of risk based on objective data, and it is a useful tool.

Unfortunately, thresholds vary depending on region and season. For example, if you have

bees in Florida, where honey bee brood production (and therefore varroa mite reproduction) takes place throughout most of the year, infestations can develop rapidly year round. Thresholds for treatment there are lower than in Michigan or Maine which have much shorter seasons for rearing honey bee brood. I keep my bees in Kentucky, not far from the Ohio River. Here, as I write this in late February, my colonies are starting to increase brood production, and *Varroa* reproduction is also increasing. My threshold will be somewhere in between Florida and Maine.

Interpretation of the *Varroa* count varies with time of year as well. In the Spring, or prior to the onset of strong seasonal nectar flows, we use lower thresholds when making decisions about treating. That is because a colony's brood production is ramping up and *Varroa* populations can explode suddenly. It's better to be fore warned and treat, if necessary, before honey supers go on and monitoring becomes much more cumbersome. I recommend considering control measures at levels of just one mite per 100 bees early in the Spring build up. By control, I mean the use of a registered miticide; homemade remedies are not effective. Later in the season, after the honey flow ends, is the other critical time for *Varroa* monitoring. At that period I use a threshold of three mites per 100 bees to indicate the need for immediate treatment. I'm comfortable with these suggestions for the mid-eastern U.S., but I strongly urge beekeepers to consult with their state bee inspectors or university extension specialists for thresholds in their area. As I've mentioned before, the Honeybee Health Coalition website (**https://honeybeehealthcoalition.org/varroa/**) is another excellent source of information about protecting your hives from varroa, and other health concerns.

Methods: The most accurate method of monitoring is an alcohol wash. It involves collecting a sample of adult bees and placing them in a liquid (normally alcohol) which causes the mites to release their attachment to the bees and float in the liquid. The bees are then separated from the mixture making it easier to count the mites which remain behind. Traditionally, beekeepers have used various devices, some commercially produced, but mostly homemade, to conduct alcohol washes. Windshield wiper fluid can be substituted for the alcohol, though a low suds, winter solution is best for visibility. I always use the most inexpensive alcohol I can find.

Keep in mind that this process will kill the bees, and be careful to ensure that the colony's queen is not in your sample. Carefully check the frame, or frames, from which you will collect the bees for testing, and make sure she is not there. Even better, locate the queen before sampling, and isolate that frame. I prefer to find her and place her with the frame she is on in an empty nuc box while taking the sample. The recommended sample size is 300 bees, or ½ cup. It doesn't seem possible that that many bees will fit in such a small volume, but it's a pretty good estimate. Take my word for it, or count the dead bees individually if you will. Some beekeepers hesitate to kill 300 bees, but 300 from a colony of 20,000 or more adult bees is a tiny percentage of the colony's population, and well worth the sacrifice to gain accurate results. If the colony is weak, you can take a smaller number, though 300 bees is the optimum number for accurate results.

There are alternative monitoring methods which do not kill bees, but an alcohol wash is the most efficient. Other options include sticky boards and powdered sugar rolls. I discussed these alternatives in an ***Ask Phil* column in June 2015**, if you are reading this article in an electronic format, you may click on the accompanying link, or contact me for a copy of the column. As I described in more detail in that article, sticky board monitoring can yield some information, but the results are more difficult to interpret because they don't take into account the population of the colony. By expressing results as a ratio of mites to bees, both alcohol washes and powdered sugar rolls eliminate the variable of colony size. However, because some varroa fail to release in a powdered sugar roll, an alcohol wash is more precise. It's also quicker and

simpler to perform, so it is the method of choice for most beekeepers. For those who prefer to conduct powdered sugar rolls, please note that, whereas this method does not kill bees, it is still better to find and isolate the queen to avoid injuring her.

Using the *Varroa* Easy Check: Most beekeepers understand the importance of monitoring for *Varroa* mites, but many still don't do it – maybe because they don't know how, because they don't have the right equipment, or because it's messy. In 2016 Véto-pharma saw the need for a reliable, easy to use, and durable tool to simplify the monitoring process. The product that resulted is the *Varroa* Easy Check, designed to be used for varroa alcohol washes.

The Easy Check is made up of three parts: a clear plastic bowl, a white basket with holes, and a tight fitting lid. **Step 1)** Start by pouring just enough fluid into the bowl to cover the bottom of the white basket. You can use denatured (rubbing) alcohol purchased from any retail store or Winter windshield washer fluid (with contains alcohol) as described above. **Step2)** Find and isolate the queen, or carefully check for her on the frame or frames from which you intend to take your sample. **Step 3)** Take your sample. The basket contains two lines on its interior surface between the rows of holes. It takes 300 bees to fill the basket to the top line; 200 to the lower one. Scrape the basket down the surface of brood frame being sampled as shown in the photograph. Be sure to scrape the frame down, not up. As you pull the basket along the face of the brood frame bees will fall into the basket. For best results, fill it all the way to the top line.

You could also sample the bees by shaking them from the brood frame or frames into a plastic tub, and scoop them out with the basket. **Step 4)** Twist and shake. After you have collected enough bees, secure the basket in the bowl and quickly twist the lid on to prevent the bees' escaping. Shake once to immerse them in the liquid. This will kill both the bees and any mites on them. Remove the lid and add the washing fluid to the fill line on the transparent bowl. (The fine line is marked inside the bowl). Re-secure the lid and shake the EasyCheck for 60 seconds. You can shake vertically, from side to side, or rotate it to optimize separation. (If you're in a remote beeyard it's OK to sing out loud while you bust a move. Use discretion in more populated areas.) **Tip:** Keep the Easy Check upright. You may be tempted to turn it upside down to dislodge the mites from the bees, but that could jam the *Varroa* in the lid and prevent them from falling though the holes. **Step 5)** Counting**.** The transparent bowl makes it easy to count the mites, either before or after removing the basket of bees. After noting the number, you can filter the liquid through a very fine sieve or cloth into a collecting container and reuse it on the next hive. **Step 5)** The numbers. To calculate the percentage of infestation, divide the number of varroa counted by 3 (if 300 bees are sampled), by 2 (if 200 bees sampled) or adapt the formula according to the size of your sample. This gives you a *Varroa* count per 100 bees.

For more information about the *Varroa* Easy Check, go to **http://www.veto-pharma.com/61-varroa-easycheck.html**. An instructional video may be viewed at: **https://vimeo.com/174841012**.

Those of you who read my column in *Bee Culture*, or have heard me speak, know my philosophy of beekeeping: that we have an obligation to the honey bees in our care just as farmers do for the health and well-being of their livestock. To fulfill that obligation it's vital that we make ourselves aware of what is going on inside our hives. The purpose of the *Varroa* Easy Check is to encourage beekeepers to monitor by making the procedure more convenient. The important thing is to inspect your hives frequently and monitor, monitor, monitor. BC

BIGGER PICTURE

Jessica **Louque**

Pesticides and Beekeepers – A Difficult Relationship

In previous months, I've given a presentation on pesticides and beekeepers several times. It's garnered mixed reviews based on the audience, but overall has been fairly well received. After reading some of the columns in *Bee Culture* and seeing some of the things being posted on the internet, I decided it might be time to convert it to an article.

The internet seems to have become the source for unverified information by "experts" of all genres. If something is posted on Facebook, then it is clearly true and scientifically valid. For those of you who don't like surprise endings – my position is that education is the most important factor in this Bees vs. Pesticides trial that is happening across the world.

History of Insecticides

Ignoring the bee side completely, let's take a quick look at insecticides in America's history. Although plant protection products have been used for thousands of years, most recognizable history would start in the nineteenth century with arsenicicals, particularly the use of Paris green for control of everything from mosquitoes carrying malaria to Colorado Potato Beetles. It's also a pigment used in fireworks. As mentioned in Katherine Kiefer's article in *Bee Culture* in April 2017, this formulation as lead arsenate was used for coddling moth control to the point that the tracts of lands affected are no longer habitable by humans. DDT was discovered earlier than it was used for an insecticide, but those properties weren't recognized until the late 1930s. Aside from DDT and the organochlorines, organophosphates (OPs) and carbamates were the main classes of pesticides to be used in residential and agricultural areas. Currently, only 36 or so are still registered in the U.S. and most of those are for agricultural use. They are toxic to mammals, birds, fish, insects, amphibians, and in particular can cause cancer, neurodegenerative, and reproductive effects on humans with increased exposure (such as field workers). The largest man-made disaster in history occurred due to the production of carbamates when a Union Carbide plant exploded in India and killed something like 3800 people – not just from the explosion, but from the toxic release of chemicals. The OPs produced Sarin, a chemical warfare agent that was discovered when German chemists were attempting to develop a stronger pesticide. Exposure to Sarin in miniscule amounts can cause death within minutes without an antidote. Deadly nightshade (*Atropa belladonna*) is an antidote because it essentially slows a body down. The scientific name, "pretty lady" comes from the use of belladonna by women to dilate their pupils to appear prettier. Belladonna by itself can be extremely toxic, but as always, the dose makes the poison. If belladonna (in medicinal form) is administered to a Sarin victim, death may be avoided but neurological damage may never go away.

Some common OPs and carbamates that can be purchased for agricultural use, or even at a home improvement store, are:

Orthene® (acephate): used in agriculture for sucking/chewing pests

Lorsban® (chlorpyrifos): used mostly for urban and home pests

Spectracide® (diazinon): sold for homeowners to control home pests

Sevin® (carbaryl): sold for homeowners to control garden pests

Malathion/Parathion: vector control for mosquitoes – likely has saved millions of lives from mosquito-borne diseases, also used in prescription lice medication for kids

These chemicals have been mostly replaced by newer and safer chemicals, but they are still highly effective and used when necessary. This class also has to be used at a higher rate than more recent pesticides and can be quite expensive to purchase.

Pyrethroids were the next major class to be used in large quantities. Pyrethrin is derived from *Chrysanthemum cinerariifolium*, which is a mum. It's a pretty potent insecticide, and if it's used as just pyrethrin, it can be considered organic because of its origins. Pyrethrin or pyrethroids (the synthetic version created in a lab) can be combined with PBO, or piperonyl butoxide, which acts as a synergist and can increase the efficacy of a pyrethroid by inhibiting the ability to metabolize pyrethroids by the target pest. This is fairly common in pesticides that are used to combat bed bugs or insects that have built up a pyrethroid resistance.

One of the major benefits of pyrethroids is that they are considered "low toxicity" to mammals and birds. For farm workers or people in higher exposure situations, this means they are less likely to have long term detrimental effects or suffer acute effects from a pyrethroid. The downside to pyrethroids is that they don't break down in water so they can be highly toxic to fish. On the upside, it takes a low dose to be

Aside from DDT and the organochlorines, organophoshates (OPs) and carbamates were the main classes of pesticides to be used in residential and agricultural areas.

One of the major benefits of pyrethroids is that they are considered "low toxicity" to mammals and birds. The downside to pyrethroids is that they don't break down in water so they can be highly toxic to fish.

effective, meaning that it doesn't take as much chemical to control the target pest and not as much is added to the environment. It also breaks down quickly in sunlight, so a foliar application is likely to degrade before it reaches a water sources and damages a fish population.

As I understand it, pyrethroids are common both in urban and agricultural settings, but most of my experience has been in the (urban) human side. Some pyrethroids that the average beekeeper might be familiar with would be Talstar® (bifenthrin), Suspend® (deltamethrin), Demand® (lambda-cyhalothrin), or permethrin. There are several over the counter (OTC) versions of permethrin sold for things like soaking your clothes before hiking, or an OTC lice control. As some of you know, part of my past research experience was on working with compounds to be used in an urban environment on pests that a typical homeowner or urbanite might encounter. Bedbugs can be a serious issue. I remember seeing a presentation by a professor who spent a significant portion of her research in low-income housing areas. She told a story of meeting a woman sitting on a couch surrounded by dead bedbugs. It turns out that the woman had so much cocaine (it may have been crystal meth) in her bloodstream that it killed bedbugs who bit her. In the event that a bedbug problem establishes in your living area, that may be a new pest control option. Whether you choose to partake yourself or hire someone who already has would be up to your discretion!

Now, heading into the "Code Red" territory of the beekeepers, comes the Neonicotinoid class of insecticides. This is probably the most recognized class of insecticides by the general public. It was developed from nicotine, so it reacts similarly with insects as people who are addicted to nicotine. It's low toxicity to mammals, birds, and fish make it safer to the environment than most of its predecessors. It's also around people more than people would recognize – particularly their children. Imidacloprid is one of the most common active ingredients in flea and tick control. I would bet that most of you with pets have purchased imidacloprid in some form or fashion from your vet to keep ticks and fleas off of your pets and out of your house. Merit, another trade name of imidacloprid, can be purchased from a home and garden store for garden use. I personally have used it before to get rid of scale insects on some of my house plants. Most purchases of neonicotinoids are for agricultural use in some form or fashion. Clothianidin has received a lot of press because it's used predominantly as a seed treatment (under trade name Poncho®) for corn. Thiamethoxam is used in agriculture and has something called the "Vigor Effect" because it creates healthier plants as a byproduct of application.

Dinotefuran is the crux of this chemistry class as far as public knowledge. Most people heard about the issue in the Oregon parking lot where linden trees were sprayed and killed thousands of bumble bees. I'm going to get a little off-topic here but I think this story needs some explanation. Most people I've heard from are of the opinion that it was clearly the fault of the pesticide for killing bees and it should be banned. However, it doesn't seem that many people consider the situation that led to the death of those bees. As I understand it, aphids were on the linden trees and excreting "honey dew" on people's cars while they shopped. Customers were complaining, so a contractor guy went out and blasted the trees with dinotefuran in a backpack sprayer – during full bloom in daytime. The store ended up initially bagging the trees to stop the exposure, and cut them down entirely when they couldn't figure out what to do to stop the PR nightmare they were now facing. So, what should have happened here? Well, if I did that with my pesticide applicator's license, at the very least it would be revoked, I'd lose my job, and most likely have to pay a hefty fine. In this case, the pesticide itself was demonized for blatant disregard of the label and little attention was paid to the human negligence that caused the situation to occur. I had an entire apiary site recently poisoned with a pesticide and lost 70 hives and a lot of money in replacement cost – but it doesn't mean I think pesticides were to blame. It was straight-up uneducated human caused, whether by vandalism or misuse of some sort.

I've had a lot of experience with this particular chemistry, and I daresay it's most likely the most hands-on experience with honey bees and neonicotinoid exposure of any of the researchers in the US. I can look at a colony of bees with high exposure to a neonic of any kind and be able to tell you the symptoms that prove neonic exposure, and I can tell you that the level of exposure that causes significant long-term effects is much higher than what would commonly be found in an agricultural setting of normal label use.

Pesticide Registration

As I've mentioned in some previous articles, we test pesticides to determine their effects on honey bee colonies. All of these chemicals are evaluated fairly extensively and incredibly expensively. We on the bee side are at the end of the line. Worker Exposure trials are usually the most important because the health of humans comes first and foremost in pesticides. The effects on animals are secondary if we all

I would bet that most of you with pets have purchased imidacloprid in some form or fashion from your vet to keep ticks and fleas off of your pets and out of your house.

die immediately from exposure, or develop reproductive complications, or everyone gets cancer. Next comes birds, fish, and amphibians. These studies have to go through all different forms of exposure to evaluate not only acute (immediate) effects, but long term to the point of following the life of the exposed parents' offspring and comparing them to unexposed parents' offspring. Bees were not particularly a concern until maybe 15 years ago in the U.S. and we're now playing catch-up on chemicals that were registered prior to this addition. New chemicals automatically run the gamut, but older chemicals are tested once their re-registration process begins (as happens with all pesticides, based on class of chemical).

A few very brave people have asked me how much we get paid off to make these chemicals look safe. These people obviously have not thought through the process of registration, or are uneducated in the pesticide industry. These chemical companies do not want the public relations monstrosity that comes with a bee kill, even when it's unintentional. They're not going to pay off a contract research organization to skew the data. Even if they did, we wouldn't be able to falsify the data. We do these studies for years on end, which is why it seems like the public tidal wave of demand far exceeds the available information – we're just not done yet so we don't want to give false information. We have internal auditors that make sure we don't screw up anything and document properly, the sponsor companies have auditors to make sure we don't botch something important and that we're trained properly for the job, and the EPA audits all the labs that produce data for registration. Every study we do for registration follows the Good Laboratory Practices (GLPs) guidelines. If it doesn't, it will be rejected almost immediately. If you'd like to know more about GLP, please feel free to look this up. If you have an insomnia problem, I would bet that this could cure it within minutes. In essence, we record everything in a way that if someone else wanted to reproduce our study, they could follow everything we did and should come up with the same results. It's also a way to show accountability because we sign off and date everything that is recorded.

These chemical companies do not want the public relations monstrosity that comes with a bee kill even when it's unintentional.

For this registration process, we look at everything from effects on an individual bee or larvae (these are lab studies that other labs do but we don't) to how the colonies are affected over the course of a year. We monitor brood cycles, marking 300+ eggs and follow them to adult emergence in different treatment rates. We assess colonies to the 5% coverage of everything on each side of a frame at pre-determined timepoints throughout the study for every frame side of every box of every hive in the study, usually numbering close to 100 colonies. We also test the chemicals by applying by the label and analyze the crops themselves to see what residues might lead to honey bee exposure. We hand sample pollen and nectar from thousands of flowers, or use bee colonies and trap pollen or collect foraging bees and dissect hundreds of bees per sample to pull out their honey stomachs and amass a sample of collected nectar to see exactly what goes into a hive. We have to know the physiology of every type of plant we work with, from the anther production to the dehiscing temperature to the difference across soil types. If we miss the bloom by a day or sometimes a few hours, we've lost an entire sampling point or potentially a study. We are constrained by environmental factors, and more than once have had battles with hurricanes or F4 tornadoes. These are complex, difficult, and expensive studies that require a lot of education and hard work to accomplish. We may come across issues in our studies, but I can assure you with every study that's come across my desk that it was as good as we could possibly make it within the parameters we had to work with.

Neonicotinoids in Agriculture

Since neonicotinoids have been all the rage these days, I thought it might be a good primer to discuss their role in agriculture across the United States. Obviously, there are benefits to pesticides or a farmer wouldn't use them. Farmers have a strict budget to maintain or they lose their profits for the year, and farm managers are only given a certain amount of money and have to use consultants and scouts to predict what will be the biggest problems of the year. In the commercial farming operations across the U.S., neonics average a 19% yield increase in the common crops. This doesn't include potatoes, which increases by over 70% in yield with neonic use. There are over 130 million acres in production yearly that depend on seeds that are coated with a neonicotinoid product. For applications, the estimated amount of money it costs to purchase neonics and apply them (paying labor and equipment) is $782 million per year. This primarily affects corn, soybeans, wheat, cotton, and sorghum. As you may notice, most of these are not highly bee attractive (cotton excluded). Bees will go to these, but monoculture farming is no better from a bee perspective than the perceived pesticide exposure. If you're eating nothing but cheeseburgers and the cows happen to have been treated while they're alive and you die of heart failure, it would be pretty hard to say it was from the treatment and not the nutritional (or lack thereof) aspect.

If neonics are banned from the U.S., it's going to be financially more difficult for most everyone but the chemical companies. I don't think a lot of people calling for these bans truly understand the repercussions of their actions. It's almost like

We monitor brood cycles, marking 300+ eggs and follow them to adult emergence in different treatment rates.

In the commercial farming operations across the U.S., neonics average a 19% yield increase in the common crops.

there's some sort of bizarre mindset that if neonics are banned, then no pesticides will be used. Instead, something more ecologically hazardous like the aforementioned organophosphates or pyrethroids will slip into the mainstream use. The estimated cost difference is not just in dollars, but in pounds (and I don't mean British money). Without the use of neonics, an additional 15.1 million pounds of insecticides will be added to the environment to produce the same effectiveness. Most of these are expected to come from the organophosphate class, which will be less safe for farmers, field laborers, families, and most anything in contact with them. It more than doubles the amount of pesticide being added to the environment. In addition, it will add an estimated $848 million dollars on purchasing these alternate pesticides, and 80% of that cost increase is corn. This adds between $2-10 per acre for the 130+ million acres in production. This isn't just going to come out of the farmers' pockets, but the consumer as well. Take a moment here and think about what's happened in Europe – do you think nothing replaced that neonic use or do you think the chemical companies are turning a nice profit filling in the gaps from the replacement pesticides? How is that going to affect the health of the public and the prices on their wallets in the long-term?

Education

As I stated at the start, I believe that education is the key to a lot of issues that are prevalent in this argument. Beekeepers are some of the most opinionated people I've spoken with on the topic of pesticides, but a lot of them are not educated in that area. If I had my way, all beekeepers would have to take the private pesticide applicators licensing exam to at least educate themselves on the topic. In some sense, I think an "uneducation" would be beneficial – of not quoting things that pop up on Facebook or Instagram or Snapchat. Just because somebody made a meme about it doesn't mean it's true. Albert Einstein didn't say jack crap about honey bees disappearing from the earth. Not only that, but people could indeed survive without bees even if it was with lower quality food – not that most people seem to care about that. Let's be honest with ourselves as a society – bees don't pollinate most of what goes on a cheeseburger and that's the staple of the American diet. Just watch My 600-pound life on T.L.C. and see how many of those foods ever saw soil as an origination point. Please take into consideration what the source of your information is.

Another point here is that everyone has an agenda nowadays, but it's up to you to decipher it. If someone is saying that literally every pesticide ever is killing bees and should be banned, what do they gain from that? Do they get paid more for pollination services? Do they get more grant money for research projects? Are they asking for public funding to pay for their salary to support their ideas? Or, do they create studies that purposely show no effects when there was one?

I don't honestly know how to tell the average beekeeper how to read a peer-reviewed published report and pick out the major issues without a science background, other than find someone to ask about it that might know what's happening. To be fair, it's beneficial on my end for everybody to keep complaining about pesticides because that's what fuels my industry. For my sanity, it drives me crazy to think about what the long-term damage will be if we as a whole start making emotional decisions that have no real science basis just to avoid the conflicts. BC

Jessica Louque and her husband, Bobby run Louque Agricultural Enterprises, a contract research business specializing in apicultural studies.

THERMOGRAPHY

You Can See Inside

R. Micheal **Magnini**

Honey bees are among the very few insects that produce body heat. This is a result of the digestion of honey (sugars) that release thermal and chemical energy through oxidation (burning). The evolution of honey bees suggests that increased honey stores provided more heat – for longer periods of time – allowing migration to regions of high elevation, cooler average seasons, and longer winters.

Honey bees uniquely regulate their body heat individually and collectively. Each bee produces its body heat by flexing, pulsing and shivering its wing muscles. This heat is then dispersed through the colony cluster by rotating waves of bees moving over, into and out of the surface of the cluster. Well provisioned colonies would survive the dearth period permitting the queen another season. Evolving in this way honey bee queens have developed longer life spans, and are currently estimated to average five – six years.

The limit of honey bee migration either north or south occurs where the nectar season is too short or too light to produce adequate Winter stores. The natural habitat of *Apis mellifera mellifera* (Nordic black bee) reaches the 55^0 latitude in parts of northern Europe.

Because of this ability honey bees have become very good producers (and providers) of the perfect food – honey.

Honey bees must be warm to survive. The temperature tolerance of the queen is quite limited requiring the heat generated by the colony. At the core the temperature remains mostly stable at or near the ideal for the queen. The surface of the cluster usually has a lower temperature than the core. This surface heat (temperature) varies considerably depending upon external conditions.

These temperatures – core and surface – are primary and de facto indicators of colony health.

Beekeepers in temperate climatic regions, experiencing Winter seasons, commonly feed in the Fall and then wrap hives for Winter. Now their work is done, and one must wait until Spring to see which hives won or lost the Winter lottery.

Technology today has made it possible to conduct meaningful internal inspections without any disturbance or interference to the Winter colony. Let's examine this technology as it applies to beekeeping.

Heat energy is measured as electromagnetic waves in the spectrum from 9,000 to 14,000 nanometers. This is commonly referred to as the Infrared spectrum, abbreviated as IR. All objects above Absolute Zero emit or radiate infrared energy. Electronic detection of this non-visible infrared spectrum is reproduced as a visible thermographic image on several hand-held devices. Variations in temperature appear as color enhanced images of the object(s). Independent of visible light these devices operate effectively during daylight or night. When viewed through a thermal imaging camera, warm objects stand out well against cooler backgrounds; humans and other warm-blooded animals become easily visible against the environment,

Originally designed for military use these devices have become very useful for domestic applications. Formerly an expensive piece of technology, thermal cameras today are quite affordable.

It is not my intention to review the current range of devices, however I will describe several thermal camera devices that would be suitable for beekeeping purposes.

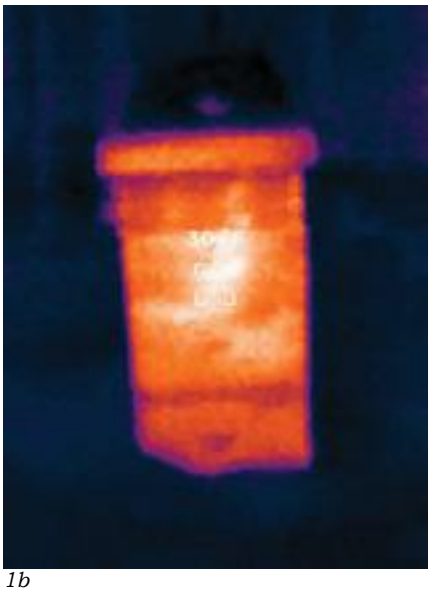
FLIR C2 Compact Thermal Imaging System [1]

The radiometric image stores 4800 pixels capable of capturing thermal measurements from -10°C to +150°C.

Seek Thermal Camera for Android [2]

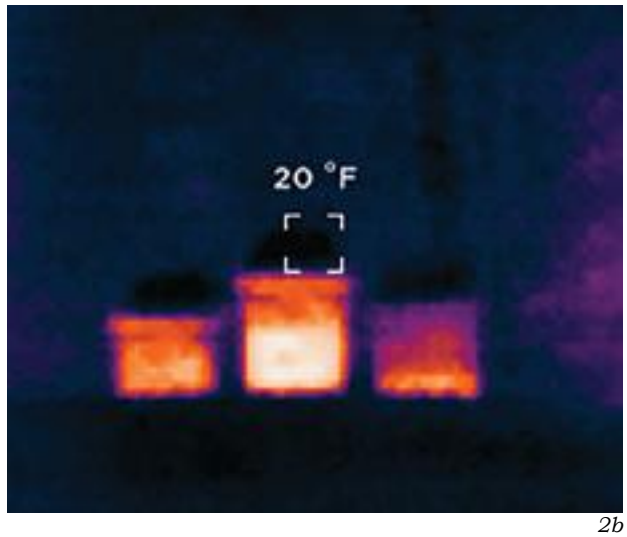
With over 32,000 individual thermal pixels it has a range of detecting temperatures from -40°C to +330°C.

1a



1b

2a



2b

Seek Reveal - All In One Handheld Thermal Imager with Flashlight [3]

A 36-degree wide field-of-view (non-adjustable).
Ten hours of operational battery life.
206 x 156 Thermal Sensor accurately measures temperature differences from -40°C to +295°C.
Intuitive controls for one-handed operation.
Save thermal images directly to the included SD card.
Also 300 lumen LED light.

FLIR ONE Thermal Imager for Android [4]

Scene temperature range: -4°F to +248°F (-20° to +120°C), operating temperature: 32°F to 95°F (0°C to 35°C)

FLIR Systems FLIR E4 Thermal Imaging Camera, 80 x 60 with MSX [5]

Display: 3" 320 × 240 color LCD
On-board 640 x 480 Digital Camera; Simultaneous storage of IR/Visual/MSX images
2% accuracy with temperature range from -20°C to +250°C (-4°F to 482°F)
Swappable Li-ion Battery with four hour life

FLIR ONE Thermal Imager for iOS by FLIR [6]

CAT PHONES S60 Rugged Waterproof Smartphone with integrated FLIR [7] camera

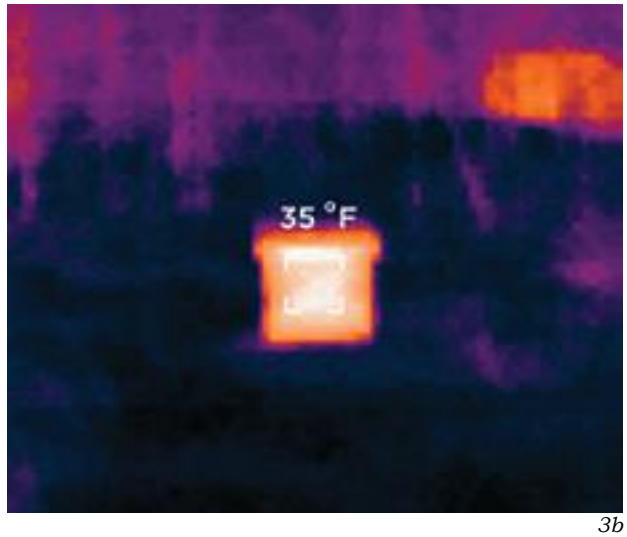
Excluding video systems, there are three modes of thermal imaging cameras. The first type is the dedicated thermal camera that operates as one unit. The second type requires the use of a cell phone device to display the images, and the third type is the integrated thermal camera/cell phone such as the CAT.

The thermal imaging devices listed above have an approximate price range of $400 to $1,200 dollars U.S. More expensive devices can be found up to and exceeding $15,000 dollars.

The model of thermal camera I placed in my beekeeper's toolbox is the Seek Reveal. The only deficiency lies in its ambient operating temperature range of -14°F to 149°F (-10°C to 65°C). But who really wants to trudge through the snow when it is -30? I find this thermal camera a very functional Winter inspection tool to determine the size and strength of colonies without any disturbance to the hive whatsoever.

The thermal camera will produce a graphically represented 'heat signature' emitted by the object it is focused on. This allows the beekeeper an internal view of the beehive, the distribution of the heat within and

3a



3b

the relative intensity of that heat. Although the thermal image will display a temperature reading at the reticle (the little square sight at the center of the image), this reading is of the external surface of the object. This is not the internal temperature of the beehive. To acquire an internal temperature a thermally conductive probe would need to be inserted through an opening into the cluster. The displayed temperature reading on the thermal image will be close to the ambient air temperature, or a little higher if there is strong sunlight, and/or heat transmitted from inside.

The thermal image of the wood stove I have provided demonstrates this particular function. The heat generated by the fire inside the stove is much higher than the surface reading.

In image 1a, we see the beehive in daylight on February 12, with the ambient air temperature at 24°F (- 5°C). Next to it we see the same beehive as a thermal image (1b). The Seek Reveal has seven image filters, which modifies the IR radiation into a color-coded image. I have used the filter named Tyrian. These filters display the thermal image in various shades including black and white.

In this image (1b) the colony cluster is seen as a bright white/yellow ball in the center of the hive with a cooler corona of red diffusing into blue around it. This is an ideal heat signature, and position for the cluster, which can then be confirmed as currently alive and healthy. This inspection took only a few seconds to perform.

In image 2a we see the beehives in their daylight position on the same day. In this view it is not possible to know the conditions inside the three hives. However when we examine them through the thermal camera (image 2b) we can easily see the positions and relative strengths of the clusters. In the hive on the far left the heat signature is dispersed throughout the hive body and a small bright point is evident in the lower right corner. The core of the cluster would most likely be found at that bright spot. That position would indicate, on speculation, that the right side of the hive body has better insulating, or wind protection.

In the middle hive the cluster appears strong (brightness), and well centered. The hive body is obviously well protected from wind on both sides, and has sufficient stores to generate this heat.

The hive on the right reveals a cooler cluster located at the bottom of the hive body. This may be a response to the prevailing wind approaching from the right of the image (easterly). Should there be sufficient honey stores in the hive this colony may survive the winter intact. Otherwise, it may be a cause of concern.

Follow up thermal inspections performed daily or weekly would indicate movement of the cluster within their respective hives, and any changes in heat output. If a hive demonstrated a weakening condition, i.e. diminishing heat signature, intervention would be appropriate.

Depending upon the time of year that the life threatening condition presented itself, would determine what sort of intervention would be appropriate. If it were occurring in mid-winter then moving the hive, i.e. skidding or sledding, to an indoor or protected location may save the colony. Should the weakness be detected in the springtime the quick rescue intervention may consist of immediate emergency feeding.

The quick and accurate inspections by thermal imaging provide beekeepers with relevant and immediate intelligence on their colonies at all times.

Thermal imaging can be used for research purposes to study and follow treatments on the colonies as well as modifications to hive equipment, orientation, locations, etc.

The use of thermographic images could significantly reduce the incidence of Winter losses through the awareness of internal conditions, and the results of applied treatments and preparations.

Image 1b displays the heat signature of a colony within a hive body consisting of three deep supers and a medium. Image 3b displays its heat signature within a hive body of one deep super and one medium. Both hives are located within fifty feet of each other in the same yard. Both hives have surface temperatures above the ambient air temperature. Both hives display internal conditions consistent with large, healthy clusters centered in their respective hive bodies.

These two hives were confirmed in the autumn to be packed full of honey stores. This then remains as a primary test of hive body size as it pertains to Winter survival. The springtime thermal readings and ultimate colony strength upon emergence in April/May will provide practical knowledge of the effects of hive body size for over wintering in this climate.

Many other experiments can and should be conducted using this new technology that will, I'm sure, enhance the understanding and practical application of wintering honey bees.

I look forward to conducting other experiments such as the activity of honey bee colonies at night, and under other conditions.

Perhaps the condition of swarming may be detectable in advance by thermal imaging. I am impressed with this technology and see it as becoming a standard tool for the serious beekeeper. BC

1,2,3,4,5,6,7 **www.amazon.com**

He Fought The Law . . .

Noel **Sweeney**

Law is our language of natural justice which we use to speak for the strong and the weak. Part of its purpose is to protect us from the power of the state and the caprice of the police. The value of law beyond price is that it applies to everyone regardless of position or riches.

Occasionally a case is decided which on its face is straightforward yet within the judgment it shows and shines a philosophical gem. A simple claim for a declaration on registration of bees could raise an issue of constitutional importance. It can at best show the court in action against an anarchic threat of abuse of the law by a beekeeper. No court in a democratic society could afford to ignore such highfalutin words lest they become deeds.

Constitution

The Florida case of *Trescott v. Connor* [1975] is just such an example of one in operation. This case proves that the power of bees in trees and hives can symbolise the reason for legal principles in our lives. Stanley Trescott, the plaintiff, claimed his case raised a principle of the Constitution. Obviously such a claim struck a jurisprudential chord with the relevant authorities. As a result three judges, two District Judges and a Circuit Judge, rather than a single judge, sat on the bench to rule on the case.

Trescott was a resident of Florida and a migratory beekeeper. He had maintained multiple beehives for many years in Florida. During the Summer months, he transported them to New York and then brought them back into Florida for the latter part of the year.

The Florida Statutes regulated the bee industry in Florida. Trescott agreed a regulatory bee industry law was needed in Florida and in other states of the United States subject to a quaint proviso: it was just that he did not want them to apply to him.

Initially Trescott contended that Florida's entire bee industry law was 'unconstitutional'. However he 'amended' his complaint before the court and he focused on the certificate requirements contained in the Florida Statutes. Before he could bring his bees back into

Florida, he had to obtain a Certificate. Trescott disputed the validity of that requirement and claimed it was 'unnecessary, onerous, burdensome and unconstitutional'.

Trescott took legal action and sought a 'declaration' that the Statute was 'unconstitutional'. His application went to the root of the Constitution. Trescott applied for an injunction to prevent the authorities from controlling the bees in Florida.

The issue centered on the interpretation of Chapter 586 of the Florida Statutes:

'All honey bees . . . and used beekeeping equipment shipped or moved into the state, or shipped or moved within the state, shall be accompanied by a permit issued by the Commissioner. Before any bees . . . or . . . equipment is shipped or moved from any other state into the stage, the owner thereof shall make application on forms provided by the commissioner for a permit. The application shall be accompanied by a certificate of inspection signed by the state entomologist . . . inspection within the period of *30 days* immediately preceding the date of shipment or movement into Florida . . . evidence showing such bees to be free from disease.'

Trescott challenged the validity of that *'30-day requirement'* which he claimed caused him hardship. He contended that such a period and even the extensions granted to him from time to time, did not give him sufficient time to bring his bees back to Florida from New York. As his truck was not big enough to haul all his bees at once he was forced to make several trips.

Doyle Connor was acting as the Commissioner of Florida Department of Agriculture in representing the defendants. He contended that Trescott's real problem was merely logistics. His problem of transportation was no different from that of any other migratory beekeeper. They did not find the period to be a problem. Connor claimed in his defence that that was the rub and the nub of his grievance which did not withstand scrutiny.

So Connor's defence was in effect Trescott's problem, if any, was entirely self-engendered.

The evidence adduced in the trial proved Trescott's claims were speculative and self-serving. For in the past he had been able to bring his bees back into Florida within the 30-day period or within the extended periods granted by the

. . . And The Law Won

defendant at Trescott's request. Similarly other migratory bee-keepers found 'no insurmountable problem' in complying with the time. Moreover one migratory bee-keeper testified he had more hives to transport to Florida than Trescott. Nevertheless that bee-keeper found the requirements to be reasonable.

The court went into more detail than it might otherwise have done as Trescott claimed it raised a constitutional issue. Everything depended upon the 'reasonableness' of those requirements. If they were unreasonable they could be discriminatory and unfair and thus unconstitutional. However the court held that the 30-day requirement was reasonable as its purpose was to detect the presence of infection of bees before they were brought into Florida.

Trescott also challenged the '*two-year requirement*' of monitoring the movement of bees within America. He claimed it was unreasonable. The court gave Trescott short shrift and dismissed his claim out of hand as the requirement was 'a reasonable one'.

The court held that while there may be better ways of regulating the bee industry, as Trescott claimed, that was not a matter of judicial concern. That issue was purely for the Legislature. The court adopted the classic stance that their duty was simply to interpret the existing law. Any change to the law could only be achieved by the introduction of new legislation. That was contrary to their judicial role and function. In conclusion the court clarified that they were only concerned with the reason for the requirements and how reasonable they were in relation to the community practice of beekeeping.

Threat

Bearing in mind the court was dealing with a serious challenge to the law, District Judge Arnow took the opportunity to formulate a point of principle for Trescott and other citizens. The words he chose were aimed and well-timed as they chimed with an arrow-like accuracy. His pronouncement has such a resonance that it should be enshrined outside each hive:

'In this land of liberty under law in which we have the good fortune to live, any law, because it circumscribes or affects, at least to some degree, freedom of action of individuals, may to that extent be considered or viewed as a hardship and onerous upon individuals subject to it. Yet we would have it no other way because we know that, without our government of ordered liberty under law, we may lose all our precious freedoms. The plaintiff here must recognise and accept, as other migratory beekeepers Florida have recognised and accepted, that fundamental principle.'

Most people would realise when you decide to fight the law there can only be one winner. Trescott had a defined audacity that had led to his initial action. After taking action he decided to serve notice on Connor that he intended to move his bees back into Florida *without obtaining the permit required* by the Statute unless he was restrained by a court order. Then he went further and added that any action to stop his 'movement' would be met with any appropriate means at his disposal. Besides that threat Trescott made yet one more foolish move by stating that the defendants should not '*discount the use of force*'.

Hence that threat of violence by Trescott was bound to be initially met head-on by Connor. Then in turn it had to be grasped by the court. A self-appointed authority declaring what is legally acceptable to him is hardly persuasive and unquestionably had to be quashed. Certainly no common law court would take such a threat lightly: ignoring Trescott's threat was not an option by Connor; no court would even countenance the germ of such an idea.

Injunction

Connor was compelled to act and promptly served a cross-complaint seeking an injunction. Initially, before the trial, a *temporary* restraining order against Trescott was granted to the Florida authority. During the trial Trescott proved to be outspoken and recalcitrant to the end. He made it clear to the court that unless he was restrained by an Order he would bring his bees back into Florida without complying with the law. That was his declared intention regardless of the court's ruling that his claim lacked merit.

Given Trescott's negative approach the court was compelled to meet his brazen-faced boast. So they entered judgement in favour of Connor and dismissed his complaint 'with prejudice'. That unusual stricture was to restrain Trescott now and in the future. The court kept him under their control and power. Then they added this condition: the court will retain jurisdiction over the defendants' cross complaint against the plaintiff for the purpose of enforcing the permanent injunction to be entered against him. That meant that the temporary restraining order issued against him was converted and changed into a *permanent* injunction.

That strict condition changed Trescott's position *qua* bee-keeper and citizen. At a single stroke it proved to render him powerless in his fight against the law.

District Judge Arnow showed Trescott he had to abide by 'that fundamental principle' of law. For it echoed the pragmatic wisdom of Lord Denning, Master of the Rolls, who censured the Attorney-General, Sam Silkin, when the arrogant politician opposed an injunction by a 'Freedom Campaigner' and in doing so openly threatened the English Court of Appeal:

'Be you never so high, the law is above you. The Attorney General has no prerogative to dispense with or suspend the law of England.' [1977].

In citing the aphorism of Dr Thomas Fuller from 1733 Lord Denning's tone served to nail the pale politician to the court floor.

The Florida Court had to meet and treat Trescott's threat in a similar lesson-learning manner. Given the circumstances the court then shot a metaphorical legal cannonball across his bow: All the costs of the trial were taxed against Trescott.

This case was about much more than a bunch of humble bees and their imprudent owner. This was a case about bees that served to prove that everyone, be you a beekeeper or a bricklayer, a judge or a janitor, a president or a pauper, a saint or a sinner, you are still subject to the noblest idea known to us encased within the common law: the pursuit of justice. BC

Taken from the book Bees-At-Law, *by Noel Sweeney.*

Honey As An ANTIBIOTIC

Tianna **Kolody**

It's the little things that count, it seems!

Honey is widely accepted as a source of natural antioxidants, with applications for food preservation and human health. In general, antioxidants are substances that prevent or delay the reduction (gain of electrons) of reactive oxygen species (ROS), thus protecting lipids, proteins, and nucleic acids in tissues from oxidation (loss of electrons) (Al-Mamary *et al.* 2002). While ROS can cause significant damage to large molecules, it is important to recognize that these free radicals are the product of essential cellular reactions. This is where antioxidants have an important role: they scavenge for overproduced ROS to maintain a balance between oxidant and antioxidant status, thereby preventing oxidative stress to cells and organs (Poljsak *et al.* 2013). Bee products – nectar/honey, pollen, and propolis – contain significant amounts of antioxidants, but honey is the only bee product widely consumed by humans (Blasa *et al.* 2006). This article investigates two questions, namely, "Are the antioxidative properties of honey due to physical or chemical mechanisms?" and "What factors influence the antioxidative capacity of these mechanisms in different types of honey?"

Honey can be described as a complex carbohydrate solution; however, it also contains many minor constituents. These constituents include, but are not limited to, amino acids, enzymes, vitamins, and polyphenols (Saxena *et al.* 2010). The primary mechanism responsible for the antioxidative activity of honey is the quality of flavonoids and phenolic acids, both of which are polyphenols (Pyrzynska & Biesaga 2009). More specifically, the antioxidative capacity of honey can be attributed to the oxidation-reduction properties of these phytochemicals. Bertoncelj *et al.* (2007) reported a very high positive correlation (r = 0.966) between total antioxidant activity and the phenolic content of seven types of honey from Slovenia. Their finding, that phenolic content plays a significant role in antioxidant activity, was also supported by Saxena *et al.* (2010), who obtained similar results in their more recent study of Indian honeys.

While the antioxidative properties of honey have been widely attributed to polyphenols, amino acids have also been recognized as antioxidants. Meda *et al.* (2005) found that radical scavenging activity (a measure of antioxidant content) was better correlated with proline (an amino acid) content (r = 0.75) than with phenolic content (r = 0.5). Evidently, more research is required to understand the radical scavenging activity of minor honey constituents (Meda *et al.* 2005).

In addition to the chemical components, the physical mechanisms of honey are of interest to scientists studying the antioxidative capacity of various samples. In their study on antioxidant capacity of honey and correlated characteristics, Frankel *et al.* (1998) discovered a high correlation (r = 0.782) between antioxidant content and honey color. Furthermore, Frankel *et al.* (1998) found that over 60% of the variance in antioxidative capacity for their honey samples could be attributed to the color of honey. In more recent studies, the polyphenol concentration of honeys has been compared with the color. Blasa *et al.* (2006) concluded that the highest antioxidant powers and the highest levels of polyphenols were found in dark, crystallized, and opaque Italian honeys. Similarly, Bertoncelj *et al.* (2007) analyzed honey color and phenolic content of Slovenian honeys. They found a highly significant (r = -0.943) correlation between lightness and phenolic content, with phenolic content levels highest in dark colored honey (Bertoncelj *et al.* 2007). Bertoncelj *et al.* (2007) explained that the color itself does not contribute to the antioxidative properties of honey. Rather, color is a reflection of phenolic content, minerals, and pollen constituents. Collectively these studies make it clear that the chemical properties of polyphenols are ultimately responsible for the antioxidative properties of honey.

Frankel *et al.* (1998) also investigated botanical original as a potentially correlated characteristic, and found that the chemical activity of honey is significantly influenced by floral source. In their study, honey samples were taken from 14 different floral sources that varied 20 fold in antioxidant content. The highest concentration of

antioxidant content (measured in units referred to as µeq) was found in very dark Illinois buckwheat honey (432 x 10^{-5} µeq), compared to the lowest antioxidant content in light colored California button sage honey (21.3 x10^{-5} µeq) (Frankel *et al.* 1998). Furthermore, the phenolic acid composition, and consequently antioxidant activity of honey, can be attributed to the plant species foraged by honey bees. For example, ellagic acid is a phenolic acid that has been used to identify heather honey, while hydroxycinnamates are specific to chestnut honey (Pyryznska & Biesaga 2009). Additionally, Bertoncelj *et al.* (2007) identified statistically significant ($p < 0.05$) differences in antioxidant activities between the types of honey sampled. Amongst their subsamples of Slovenian honey, acacia honey had the least antioxidant activity (44.8 $mg_{gallic\ acid}$/kg of honey), followed by lime, and multifloral honey. In contrast, the values for fir honey (241.4 $mg_{gallic\ acid}$/kg) and forest honey (233.9 $mg_{gallic\ acid}$/kg) were approximately five fold higher than the value for acacia honey (Bertoncelj *et al.* 2007). Beretta *et al.* (2005), who also measured gallic acid to identify the phenolic content of honey samples, obtained similar results for acacia and multifloral honey. Interestingly, Beretta *et al.* (2005) found that the antioxidant power of honey samples of the same botanical origin were similar, despite differences in their geographic origin. For example, their value for Mexican buckwheat honey (482.17 ± 2.40 $mg_{galic\ acid}$/kg) was similar to the value, as reported in the literature, for California buckwheat honey (456 ± 55 $mg_{galic\ acid}$/kg). Throughout the literature, botanical origin has been regarded as the factor that is most influential to the phytochemical composition of honeys.

The botanical origin of honey and its processing, packaging and storage practices also influence the antioxidant value of honey (Bertoncelj *et al.* 2007). Blasa *et al.* (2006) investigated the presence of antioxidants in raw and processed Italian *Millefiori* (multifloral) honey samples. They found that the total polyphenols (mg CAE/100g honey) were 3.2 times lower in processed, multifloral honey samples when compared to unprocessed samples (Blasa *et al.* 2006). High quality commercial practices and minimal processing may help to preserve the antioxidant properties of natural honey.

This article has summarized some of the ways in which phytochemical composition contributes to the antioxidative activity of honey (Al-Mamary *et al.* 2002). Honeys that are dark in color are generally rich in phenolic compounds and have greater antioxidative potential. Moreover, in some cultures, dark-colored and strong tasting honeys (e.g. chestnut, buckwheat) are regarded to be of premium quality and perceived to provide health benefits. Ultimately, the potential impact of antioxidant content of honeys for human health should be explored through further research. BC

An earlier version of this paper was submitted in the Apiculture and Honey Bee Biology course taught by Gard W. Otis, University of Guelph.

References

Al-Mamary, M., Al-Meeri, A., & Al-Habori, M. (2002). *Antioxidant activities and total phenolics of different types of honey*. Nutrition Research, 22, 1041-1047.

Beretta, G., Granata, P., Ferrero, M., Orioli, M., & Facino, R. M. (2005). *Standardization of antioxidant properties of honey by a combination of spectrophotometric/fluorimetric assays and chemometrics*. Analytica Chimica Acta, 533, 185-191.

Bertoncelj, J., Doberšek, U., Jamnik, M., & Golob, T. (2007). *Evaluation of the phenolic content, antioxidant activity and colour of Slovenian honey*. Food Chemistry *105*, 822-828.

Blasa, M., Candiracci, M., Accorsi, A., Piacentini, M. P., Albertini, M. C., & Piatti, E. (2006). *Raw Millefiori honey is packed full of antioxidants*. Food Chemistry, 97, 217-222.

Frankel, S., Robinson, G. E., & Berenbaum M. R. (1998). *Antioxidant capacity and correlated characteristics of 14 unifloral honeys*. Journal of Apiculture Research, 37(1), 27-31.

Meda, A., Lamien, C. E., Romito, M., Millogo, J., & Nacoulma, O. G. (2005). *Determination of the total phenolic, flavonoid and proline contents in Burkina Fasan honey, as well as their radical scavenging activity*. Food Chemistry, *91*(3), 571-577.

Poljsak, B., Šuput, D., & Milisav, I. (2013). *Achieving the balance between ROS and antioxidants: When to use the synthetic antioxidants*. Oxidative Medicine and Cellular Longevity, 2013, 1-11.

Pyrzynska, K., & Biesaga, M. (2009). *Analysis of phenolic acids and flavonoids in honey*. Trends in Analytical Chemistry, 28(7), 893-902.

Saxena, S., Gautam, S., & Sharma, A. (2010). *Physical, biochemical and antioxidant properties of some Indian honeys*. Food Chemistry, 118, 391-397.

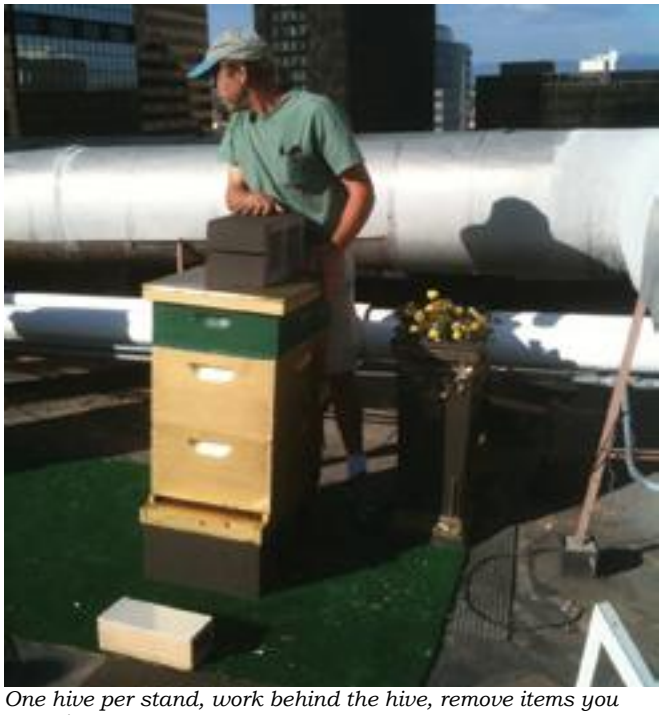
Safety First

David **MacFawn**

2 Dozen Good Ideas

Safety in the Beeyard Best Practice is the first in a series of best practices developed for the South Carolina Beekeepers Association (SCBA) Master Beekeeping Program (MBP). Safety is considered the most important best practice.

1. When approaching your beeyard, put your veil on. Stings to the eye may cause blindness. Protect your eyes. Keep bees out of your hair. If you have long hair, pull your hair back in a rubber band. The looser your hair, the easier to get a bee entangled in it if you take off your veil or it gets inside. If a bee does get in your veil, walk away from the beeyard before removing your veil.
2. Light your smoker. Smoke is what helps to control and calm your bees. There are two theories as to why smoke works. It interferes with the bees' sense of smell, and shifts their behavior from colony defense to "gorge and retreat." Don't over smoke, but apply smoke any time that you see bees looking at you. If they are looking at you, they are aware of you! You want plentiful cool white smoke – gray smoke does not have the same effect on the bees. Hot smoke will burn the bees' wings. Always check temperature of smoke – NEVER let flame rise higher than top of smoker. Do not use oils in your smoker that could potentially remain in the hive comb. Be mindful of fire safety when lighting your smoker and during use especially during dry periods or when dry vegetation might be close to your working area.
3. Wear clothing that is light-colored and loose-fitting.
4. Avoid wearing fuzzy clothing, especially dark fuzzy socks. Bees tend to sting at the elastic interface where clothing meets your skin.
5. Medical
   a. Hydration; In the Summer, make sure you hydrate prior to work and have extra water for frequent breaks.
   b. First Aid Kit in vehicle with antihistamine. and Epi-pen for possible allergic reactions. Always know where the closest medical facility is located.
6. Travel
   a. Outyards: let someone know where you are located.
   b. Have a cell phone available.
   c. Properly secure equipment in trucks.
   d. Properly enclose smoker and "cork" the flue, or extinguish before travel.
   e. If in an area where Africanized bees are present park car or truck close enough to provide emergency sheltering.
7. Avoid eating bananas prior to working your bees. The smell of bananas is similar to the bees' alarm scent. Be careful about wearing products with perfumes or colognes. Bees communicate using pheromones or scents. Introducing a strange scent could cause problems: attraction, aggression, confusion.



One hive per stand, work behind the hive, remove items you can trip on.

Light your smoker, wear light colored, CLEAN clothing.

Be gentle, move slow, work on warm sunny days, earlier rather than later.

8. Clean your hive tool to kill diseases like American Foulbrood (AFB) spores. This can be done by placing your hive tool in a lit smoker. This is a good practice to establish between hives, especially between beeyards.
9. Wash your bee suit on a regular basis to avoid contamination of diseases like AFB and to remove alarm pheromone. Think biosecurity when moving from one bee yard to another by cleaning your tools, changing or washing your suit and your boots.
10. Prior to work, scan apiary and remove trip hazards such as sticks, fallen branches, vines, and brambles.
11. Avoid standing in front of the hive. Stand to the side or back of the hive out of the bees' flight path.
12. Be gentle. Move slowly without any quick jerking movements. The more bees you squash, the more alarm pheromone is released and the more excited your bees will become. During a nectar flow you can work faster but during a dearth the bees are more defensive and you should work slower.
13. Work the colony earlier in the day when the field bees are foraging. The field bees are more apt to sting. If you have to work later, move slower.
14. If you have a drone layer colony, you will have mostly older bees that are more apt to sting.
15. Small colonies are less apt to sting than large colonies.
16. Do not wear sunglasses or leather watch bands.
17. Do not jar the hive or bump your smoker on the woodenware at the hive entrance when puffing a couple smoke puffs into the entrance prior to opening the hive.

Lift with your legs, not your back.

18. Place hives on individual stands, two cement blocks work well, to keep noise and vibrations from exciting adjacent colonies.
19. Get in and out of hives quickly. In a ten-frame hive remove frames two or nine first – not one or 10. Frames one and 10 are typically stuck to the outside wall with propolis. When replacing frames, align the Hoffman spacers on the frame you are inserting with the Hoffman spacers on the frames in the hive. This will help from squashing bees or rolling a queen that you did not see.
20. When lifting, 'bend with your knees, not your back', and put your hives lower so you can kneel while working. Bending over for long periods of time or lifting wrong may hurt your back.
21. Don't place your hives where they can be seen or regarded as a nuisance Be aware of pools, foot paths, schoolyards, playgrounds, and livestock.
22. Be aware of potential pesticide applications nearby.
23. Also remember bears like honey too.
24. Weather considerations. Work bees on sunny days whenever possible. Rainy days will have many bees in the hive and more older bees which tend to be more defensive. Even after a rain shower many bees will stay in the hive so if possible delay your inspection. Bees don't like foraging when it is windy outside. Again, try to postpone inspections until the wind is low. BC

Beeyard Thoughts, Observations, and Updates

Some of my colonies died during the Winter – should I have done more or less

The rough and ready world of honey bee webinars

Normalcy – in everything - is always changing

Normal today is not necessarily normal tomorrow. When I was a young boy, on Mother's Day in church, all those people whose Moms were still living wore a red flower while all of those parishioners whose Moms had passed wore white flowers. Typically, women wore stylish hats and men wore suits adorned with neckties. Not today. There's not a single hat on a female head – no matter the age, and only a few ties around the necks of aged men. It's normal today to be much more casually dressed. The Mother's Day corsages are gone, too.

It's normal to use a mobile phone. Phone booths are gone. As a kid, I had access to three black & white TV channels. Now the number of channels to which I have access is nearly unreasonable. *(. . . and there is still not a lot to watch).* How many more of these acculturalization changes do we need to list here? Things change. Bee industry normalcy has certainly changed, too.

Today's Beekeeping normality

*"Yeah, yeah, you've already said how cheap queens once were and how many swarms came your way in the 70s. We get it. Bee life was better then."*You would be correct to have that notion – except all aspects of bee life in the 70s was not necessarily better. Things were different, but not always better. However, in this piece, *"better and why"* is not the direction I want to take. I want to stay right here in the present.

Present-day beekeepers' colonies have *Varroa* and queen issues. That's normal. Honey crops are lower than they were. Normal. Pollination fees are much higher. Typical. Winter losses at 40 to 50 percent – not unheard of. Nearly normal. Whoa, whoa, whoa . . .

Not a great bee day – this is what early Spring looks like to some of us.

I'm becoming punchy at the suggestion that losing as much as 50% of our wintering colonies is the new normal. That crude percentage may be correct, but it certainly shouldn't be called *normal* – but that's just *my* opinion. However, I am the guy cleaning deadouts and replacing them. So I am authorized and opinion – right?

It's my complaining time of the year

It's the time of the year when I write *"winter-loss frustration pieces."* I am particularly frustrated for new beekeepers whose eagerness has been dampened by the harsh reality of winter-kills. If beekeeping were easy, I suppose everyone would be keeping bees, but truth-be-told, wintering bees has not always been this difficult.

My wife who is also one of my several editors for these articles told me that this particular piece was negative. I honestly don't mean to be negative in any of my pieces, but I do mean to *directly* address the perpetual frustration of managing winter-killed colonies and replacing them during late Winter or early Spring. If not normal, the process has certainly become routine. Dealing with deadouts is simply not a positive aspect of beekeeping and that fact cannot be ignored.

Beekeeping in the space between *problems* and *answers*

In years past, I wrote an article or two about how beekeepers must manage today's bees without needed answers. We know the problems – *Varroa*, chemical pesticides, queen genetics – but we don't yet have ready answers. How do we manage our colonies while we wait for answers and updated recommendations? In many instances, beekeepers must become their own R&D people. Sometimes "help" is simply not on the way. We all have access to the Internet, so potential solutions for our problems seem to appear nearly monthly. Yep, new answers and cutting-edge procedures are posted there all the time, but to a great degree, most solutions and answers have disappointed and faded. Otherwise, we would all be happy with our wintering colonies survivability.

Wintering . . . specifically

Several general stresses are affecting colonies throughout the season, but I specifically want to address wintering management procedures. I tend to blame all my bee management woes on *Varroa* and its secondary viral invaders. I know that we have lost floral resources and our queen stock seems wiggy at times. The thing is that I literally ***see*** both *Varroa* and the related effects of *Varroa.* I can actually ***see*** this huge problem in my colonies. Even if I have other bee problems, *Varroa* seems to the leader of my colonies ills. Next spring, I will try again (and again) to set up a control program to suppress mite populations.

U.S. beekeeping varies

U.S. beekeeping looks the same across the country. All U.S. beekeepers use the same styles of equipment and they buy that equipment from essentially the same vendors. But wintering bees in the South is simply not the same as wintering colonies in the North. Duh . . . Winter weather simply cannot be ignored. A cold Winter is hard on colonies. Southern beekeepers may have other Winter (dearth) issues, but a good, long, cold Winter is a real test of the colony's ability to survive and the beekeeper's ability to help the colony survive. This cold weather thing is simply a seasonal variation, but it is a demanding one.

If I may, a conclusion – beekeepers managing colonies during a true Winter are dealing with a huge "normal" challenge. Those in warmer areas may not feel as much pain.

Bee and beekeeper life in the cold zone

It gets cold in NE Ohio where I and my bees live. Even so, it gets much colder in states to the north and west of me and my bees. I have no lock on Winter weather challenges. In preparation for winter, I *have piddled around with various Varroa* control procedures. Most of these products and procedures work to some degree, but none have readily killed mites without considerable labor and expense – that I provide.

In my article title above, I wrote that some of my colonies died during the past Winter months. Last Fall, should I have done even more to get these colonies through the Winter? Though it may be insulting to some of you, should I ask if I should have done *less?* The Winter that is just passing has been particularly cold and long. Many nights, the temperature dropped to zero degrees or even lower. Would investing even more time and money last Fall really have helped. What in the world should I recommend to new keepers (and old ones)? Do more. Do less. I'm working on this one.

What's practical here?

I am not as young as I once was. I cannot commit unlimited energy and finance to a single aspect of my life or my bee life. Last Fall, I did the perfunctory tasks that assured me that I would be tormenting/killing mites. I allocated plenty of food reserves, and I had as good a cadre of queens (as was practical) in my colonies. The population of my colonies was average to good. Even so, it appears that I am going to have about the usual Winter loss as other recently past Winters – around 35%.

To do more would require more miticide product, more labor and time, and closer monitoring my colonies' queens. At every step, more time and expense. If I had invested even more time and money in my colonies, the Winter my bees just experienced would have seemingly killed more colonies anyway. (Of course, I can't prove that). Would the survival of more of my colonies have justified more and more input from me?

In light of my six grandkids, house and barn maintenance, gardening, social obligations, traveling, and maintaining my interest in photography and webinar presentations, should I have put even more time in colony Winter preparation? Or, should I do a decent job of preparing colonies for the Winter – hope for a mild one – and make up the Winter-kills with splits, packages and maybe the capture of a few swarms?

Losing 35 – 40% per Winter is frustrating. I can't deny that. I'm hardheaded now. You remember that old guy I discussed above who remembered honey bees from the old days? Years ago, beekeepers didn't have to do all of this extra work or deal with this extra expense. I suppose that in the deepest part of my bee soul, I am still thinking that – somehow – some way – a few divinely inspired simple procedures will put me and my bees back where we once were.

Well, I'm certainly not giving up

No doubt, I will be right here exactly a year from now – frustrated by the same events, but I will try to – some way – become more efficient when completing my winter prep work. It is profoundly clear that the bees are doing all they can do to help themselves and yet, colonies are still dying. It's up to Beekeeper Jim to make the changes that will help the bees help themselves.

So, I will do more than I did last year. What else can I do? New ideas, new products and the interest in the insulating attributes of polystyrene hive equipment could help forestall the effects of future hard Winters. One secret place that I plan to search is the old beekeeping literature when wintering help was much more extensive. Then – as now – bees are comparatively expensive. Some of the old guys actually buried their colonies. Some kept their colonies in bee houses year-round. As with current queen management recommendations, our established Winter management recommendations fail all-too-often. What I am presently doing seems to be about 65-75% effective. I have some plans to change a few management procedures. I will keep you informed as next Fall approaches. I hope a new normal is on the horizon. What novel wintering plans do some of you have?

The rough and ready world of honey bee webinars

In 1996, I was elated to get significant funding to develop and produce a satellite-delivered beekeeping class. It was a 14-part beta tape series. At the time, the series was high quality. We subsequently sold many VHS tape sets to both bee groups and individual beekeepers[1]. About one per year, I still get a comment or two. Each production was about an hour long. It was young person's project. The physical labor input and stress was significant. The events were live with no time delay (Much like today's webinars – what you say or do is what immediately goes to the world.) We went to Mexico, Texas,

[1]As an aside, one commercial vendor pirated the tapes, reproduced them and sold lower quality sets. Purchasers would then contact me to complain about the low video quality of the set. That was a bit difficult to endure.

This technology is an important beekeeper tool for many of us.

Washington, DC, and visited local beekeepers everywhere to accumulate footage.

The project worked very well. The only drawback was that you needed a satellite dish – the old huge ones – to see it in real time. I was instantly hooked on the concept of remote site presentations – either live at the moment or segments that went live at a later time[2]. At the end of each presentation, events were recorded and released in a stored format – usually the VHS tapes.

Through the years, I had the opportunity to work with different sponsors to produce both recorded and live video segments. Presently, I am involved with Editor Kim on a project that has been named the *Kim and Jim Show*. This is a newish avenue and a newish concept, but one that the *Bee Culture* staff is steadily improving. Presently, anyone with a smart phone can capture and post a video. Yes, it's true. We are all potential videographers. Some productions are better than others, but sometimes a poor video movie of a novel event – a load of bees overturning or a mating queen and drone on the ground, or possibly a raccoon undergoing a bee attack, would make for an interesting video – never mind the quality.

Webinar producers still have to address some consistent issues and opinions. (1) Many beekeepers still say, *"Yes, one of those webinars would be good, but it is so much better if you are actually here."* Saddens me to say, that statement is still true. But as a meeting coordinator, I can have quality speakers for small fraction of the cost and energy compared to having someone spend a weekend flying and talking and then flying home. Webinars can really protect a bee club's budget bottom line. (2) Using webinars too much or too often can damage a club's bottom line. If a beekeeper has the log-in information, the presentation can be watched from home. For the present time, a typical meeting should balance the number of live events at the meeting with an occasional cameo webinar event. Generally, a webinar should support but not replace a live speaker roster. (3) Always, always always have a disaster plan loaded and ready to go. Bandwidth issues, WiFi connectivity, computer or hardware failure can happen. For me, audio is the most challenging aspect of presenting a live webinar. The longest minutes of a meeting organizer's life can be those spent trying to get the remote speaker on line while either a live audience or a virtual audience, or both watches. (4) From a remote speaker's perspective, webinars are uniquely frightening. In my personal case, I have no Internet technology specialist sitting at my elbow. If something goes wrong, it is my problem to correct (immediately) and get back to a placidly presented bee talk. If there are real challenges, why even bother with this technology?

Because when it works and it usually does, it is stunning technology. Editor Kim just presented from New Zealand. It worked flawlessly, but this event should be his story. I'll say no more. This Internet presentation technology is going to evolve and grow. I cannot imagine what the next few decades will bring. I am so glad that I am still active enough to have had an opportunity to use this evolving technology. Maybe we can talk sometime – virtually. All those years ago, Dick Tracy was not too far off the mark. *(Who was Dick Tracy?) (Google it.)* BC

Jim's video comments
http://bit.ly/2pg0THn

Dr. James E. Tew, State Specialist, Beekeeping, The Alabama Cooperative Extension System, Auburn University, Emeritus Faculty, Entomology, The Ohio State University; **Tewbee2@gmail.com; http://www.onetew.com; One Tew Bee** RSS Feed (**www.onetew.com/feed/**); **http://www.facebook.com/tewbee2**; **@onetewbee**

[2]In 2011, a tornado destroyed the honey bee storage facility. All of the video masters to this program were destroyed. VHS tapes still exist. I have posted two short clips from this early satellite work at: Tracheal Mite **http://bit.ly/2pgfBhD**

Will You Be . . .

Ann **Harman**

. . . grilling or barbecuing – with honey, of course – this Summer? It all depends on where you live. In the South, *barbecue* has a strict definition. The restaurant signs will spell it *barbeque*. It is meat cooked "slow and low." That means for a long time at a low temperature. It can be done on a simple grill or a fancy gas-fired barbecue. *Grilling* can mean the cooking is done over direct heat at high temperatures. However in the rest of the country *grill* and *barbeque* are used interchangeably, separate and together, no matter what or how you are doing the cooking or what you are cooking on. Recipes for any marinade or sauce usually just call it BBQ.

So no matter how you spell it or use the term, it's time to rev up the grill for this season. Just like getting your vehicles ready for Summer travel (or Winter cold and storms) it's time to give your barbecue grill a "tune-up" for the coming season. You still have some of last year's honey available for BBQ recipes so it's time to make good use of that honey.

Honey, all flavors and colors, is a great ingredient in recipes. However, it has one problem sugar does not have. Honey burns or scorches at a low temperature. Nobody really appreciates a succulent steak tasting like burned toast or resembling a piece of charcoal. That can be easy to do when cooking with honey. But it's just as easy to avoid doing that and use honey.

If you plan to marinade the meat it is best to leave it in the liquid for a short time. It will be easier to control overheating and developing a scorched taste. When planning to grill pieces of different thickness and sizes, such as parts of chicken, precooking thick pieces can be done in the oven under controlled heat so that all the parts can be grilled and be done at the same time. You can also let meat cook partially without sauce then start brushing sauce on for the last half of cooking time. Temperature can be controlled with a simple grill by moving the hot coals aside so that the meat is not under hot direct heat too long. With a gas-fired barbecue grill the thermostat can be set to a slightly lower temperature.

You did find all your grilling tools, insulated mitts, grill cleaner brush and silly apron. Since you are using honey in your recipes you might want to consider both a meat thermometer and a grill thermometer. BBQ sauce pots could be handy. Ready to start? Let's go!

HONEY AND GINGER MARINATED FLANK STEAK

1/4 cup soy sauce
1/3 cup honey
2 tablespoons balsamic vinegar
1½ teaspoons garlic powder or 1 clove garlic minced or pressed
2 tablespoons fresh grated ginger
1/2 cup canola oil
2 pounds flank steak

Combine soy sauce, honey, vinegar, garlic, ginger and oil in a container with a tight lid. Shake to mix well. Make light diagonal slashes on each side of the flank steak in a diamond pattern. Place meat in a small pan or plastic bag and pour marinade over it. Cover pan and place in refrigerator for at least four hours. Prepare the grill for cooking on medium-high heat. Cook the steak about six to eight minutes on each side, Remove from grill and let rest for five minutes before slicing.

HONEY BBQ-MARINATED CHICKEN DRUMSTICKS

1 pound chicken drumsticks
½ cup ketchup
½ cup honey
¼ cup vegetable oil
2 tablespoons soy sauce
2 teaspoons lemon juice
¼ teaspoon crushed peppercorns
¼ teaspoon hot chili sauce
Salt to taste

Combine all ingredients except chicken in small bowl and mix well. Place chicken in large shallow dish or in a plastic bag. Pour sauce over chicken, cover dish and let stand in refrigerator for about one hour. Prepare to grill, then grill to desired doneness.

GRILLED HONEY GARLIC PORK CHOPS

1/4 cup lemon juice
1/4 cup honey
2 tablespoons soy sauce
1 tablespoon dry sherry
2 cloves garlic, minced or pressed
4 boneless center-cut lean pork shops (about four ounces each)

Combine all ingredients except pork chops in small bowl. Place chops in shallow pan or plastic bag; pour marinade over pork. Cover pan and refrigerate about four hours. Remove pork from marinade. Heat the marinade in small saucepan over medium heat to a simmer. Grill pork over medium-hot coals 12 to 15 minutes, turning once during cooking and basting frequently with marinade. Makes four servings.

HONEY BARBECUED GLAZED SALMON

1 large onion, sliced
1 cup dry white wine
1 cup tomato juice
1/2 cup ketchup
1/4 cup honey
1 tablespoon Worcestershire sauce
1/2 teaspoon chopped garlic
1/2 teaspoon chili powder
Salt and pepper to taste
4 salmon steaks (four ounces each)

Combine onion and white wine in large saucepan; bring to a boil over medium-high heat. Add remaining ingredients except fish. Mix well. Reduce heat to medium. Cook 10 minutes, stirring frequently. Transfer glaze to blender or food processor; process until smooth. Grill salmon over medium-hot coals, basting with glaze, about 10 minutes per inch thickness or until fish turns opaque and flakes easily when tested with a fork. Makes four servings.

Here is a good sauce to have on hand no matter what meat you plan to grill.

SMOKY HONEY BARBECUE SAUCE

1 cup honey
1 cup chili sauce
1/2 cup cider vinegar
1 teaspoon prepared mustard
1 teaspoon Worcestershire sauce
1/2 teaspoon pepper
1/2 teaspoon minced or pressed garlic
2 to 3 drops liquid smoke

Combine all ingredients except liquid smoke in medium saucepan over medium heat. Cook, stirring frequently, 20 to 30 minutes. Remove from heat; add liquid smoke to taste. Serve over grilled chicken, turkey, pork, spareribs, salmon or hamburger. Makes about two cups.

You can grill and barbecue all kinds of meats and fish. But you do need some vegetables, too.

HONEY-GRILLED VEGETABLES

12 small red potatoes, halved
1/4 cup honey
3 tablespoons dry white wine
1 clove garlic, minced or pressed
1 teaspoon crushed dried thyme leaves
1/2 teaspoon salt
1/2 teaspoon pepper
2 zucchini, halved lengthwise
1 medium eggplant, cut into 1/2 inch thick slices
1 green bell pepper, halved
1 red bell pepper, halved
1 large onion, cut into wedges

Cover potatoes with water in large saucepan. Bring to a boil over medium-high heat. Cook five minutes. Drain. Combine honey, wine, garlic, thyme, salt and pepper in small bowl; mix well. Place potatoes and remaining vegetables on oiled barbecue grill over hot coals. Grill 20 to 26 minutes, turning and brushing with honey mixture every seven to eight minutes. Makes four servings

Uh oh! Thunderstorm clouds have arrived with a rumble of thunder. Fear not! Take your veggies in the house and . . .

Toss vegetables with honey mixture. Bake, uncovered at 400°F for 25 minutes or until tender, stirring every eight or 10 minutes to prevent burning.

It really doesn't matter where you live or whether you call it a grill or a barbecue, enjoy summer and cooking outdoors. If your neighbor's BBQ sauce smells good, offer to exchange recipes. Just be sure you provide the honey from your generous bees. BC

BEES IN TREES

Dewey **Caron**

Beekeeping is one of the oldest forms of food production dating as far back as 13,000 BC. Human cultures were initially hunters/gathers, which included hunting of wild nests for honey and beeswax. Some human cultures continue such traditions today, such as the harvesting of *Apis dorsata* nests in the mountains of Nepal and the native honey hunters of the Sundarban mangroves of India/Bangeldesh (both highly dangerous – sheer cliffs of Nepal and man-eating Tigers that rule the Sundarbans). Mike Burgett, in an interview by M.E.A. McNeil, Dec. 2014 *Bee Culture* describes the dangers to the Sundarban honey hunters. **http://www.beeculture.com/mike-burgett-interview/**

Two interesting YouTube videos show

1. Irulas honey hunters of south central India "Honey of the Untouchables" with supurb Bee photographer, Eric Tourneret, **http://youtu.be/6gYbLek5jz8** and
2. Kulung culture (Nepal) Honey Hunters from *National Geographic* **https://www.nationalgeographic.com/magazine/2017/07/honey-hunters-bees-climbing-nepal/**

The history of humans bringing bees closer to their residences is not well documented. Most farmers kept other livestock and grew crops and keeping bees was only part of their husbandry/agriculture. Generally the beginning of "domestication" of honey bees by middle eastern cultures is cited as around from 10,000 to 4400 years ago.

With Reverend Langstroth's development of the movable comb hive (1851), German Johannes Mehring's refinement of comb foundation (1857), plus the honey extractor (von Hruschka 1864/1865 – see article by Wyatt Mangum in Sept 2016 ABJ), it became easier to keep honey bees at the convenience of the beekeeper. Prior to this, bees were often "kept" where they were found, in their selected cavities and individuals obtained their honey and beeswax via destruct harvest.

Thus a large history of humans and bees involves keeping bees in bee trees. Today we use the phrase 'keep the bees out of the trees' to signify control of swarming. Bees in tree hives are likely to swarm more frequently. When we maintain our bees in modern hives, we recommend keeping bees out of the trees. But swarming, basic bee reproduction of their colony unit, remains an integral part of what makes a bee a bee.

Langstroth wrote about tree hives in his book *The hive and the honey bee*: "*The Russian and Polish beekeepers .... are among the largest and most successful cultivators of bees, many of them numbering their colonies by hundreds, and some even by thousands! They have, with great practical sagacity, imitated as closely as possible the conditions under which bees are found to flourish so admirably in a state of nature.*"

Tree hollows are typically much thicker than a standard beehive, and as such, better able to handle the extremes of heat and cold. Bees in tree hollows do not normally construct their parallel combs to the bottom of the cavity so a debris area forms at the base of the hollow. It remains moist and comprised of organic nutrients, saw dust and living organisms. Within this micro-ecosystem, there are beneficial predators and microorganisms (viruses, bacteria, wax moths, etc) that may help the bees remain healthy. Since many of the cavities bees selected were small the bees often swarmed, which is their way of reproducing and also for "solving" issues like American foulbrood and bee mites.

David Lytle photo.

Al Chubak photo

Natural beekeeping

Currently Tom Seeley, studying bees living in hollows of tree in the Arnot Teaching and Research Forest, at Cornell, (see *Bee Culture*, Nov 2016 **www.beeculture.com/tom-seeley/**), the ONE place in Europe and North America with data on wild colony abundance before & after arrival of *Varroa* [Before (1978): 2.5 colonies per square mile, After (2002):2.5 colonies per square mile] has suggested an Environment of Evolutionary Adaptness (EEA) beekeeping management approach (also termed Darwinian Beekeeping, Apic-centric beekeeping or "natural" beekeeping). See Tom's presentation on this concept at 2017 EAS University of Delaware meeting**: https://www.easternapiculture.org/images/stories/extentions/DarwinianBeekeeping-EAS17.pdf**

Some key managements to "natural" Langstroth hive beekeeping, based on what he finds common to bees living in trees, are:

1. Average in the wild is 2.5 colonies per square mile; space colonies as widely as possible
2. Use small nests; one deep and one shallow; make less honey but colony healthier
3. Use rough cut lumber on inside of hive to increase propolis coating
4. Maintain 10% to 20% drone comb, as found in feral tree nests
5. Keep nest structure and orientation and frame location in hive intact; do not reverse boxes in Spring. Do not disturb colonies in Winter; don't supplementally feed syrup or pollen
6. Don't use top entrances and limit bottom opening to two-inch opening.

A picture is worth a thousand words! Here is a picture – from web source Pinterest (and most recently seen in Cowlitz WA Beekeeping newsletter) – that may have a 1000 questions! To begin with like Why? Why two levels? What is problem this is attempting to solve? How does the beekeeper access? What happens when you drop your hive tool? etc. For more photos of "natural" hives check out ***https://www.pinterest.es/pin/115897390382664942/***

Original man-made bee hives were small. The original Lansgstroth hive had a "garbage pit built into an incline beneath the hive. With some studies it was found that if European (Italian) bees were kept in larger boxes they would produce more honey. German bees in Europe remained in smaller boxes. Along with management systems recommending a 2nd brood box for Italian bees, cell size of commercial foundations were increased to produce bigger bees. But still today beekeepers keep bees in bee trees.

Forest beekeeping of Poland and Belarus has been nominated for listing as a UNESCO Intangible Cultural Heritage of Humanity. It already has the status of a historical and cultural value in Belarus where this ancient tradition of keeping bees in artificially-made caverns placed high in the trees, going back to 5th-6th centuries, survives until today. In Poland, although the tradition was interrupted, it is being restored.

Lynn Royce, retired OSU Entomologist and bee specialist, has an interesting Bee tree project. (**http://treehivebees.org**/) The Tree Hive is a movable frame Langstroth-type bee hive mounted to a tree on a metal stand, eight to 10 feet above the ground. The lower portion includes a "bio chamber" with decaying wood chips for organisms that would also live in a hollow with the honey bees. The bees use top and bottom entrances in Summer but the top entrance is closed in Winter.

With this project Lynn is showing that the combination of hive placement, box design, and bio chamber provides a system that is good for the bees. In a March 2015 *Bee Culture* article Lynn wrote that Bee bread from tree colonies had approximately twice the amount of fungi, *Aspergillus/Penicillium*, *and A. nige*r, as ground colonies (due to undetermined factors). A total fungus inoculum of all culturable fungi slowed or inhibited growth of chalkbrood fungus *Ascosphaera apis* in laboratory cultures, thus confirming the beneficial role of these fungi. This suggests that bee bread fungi from tree colonies are more efficient at handling chalkbrood. See full article **http://www.beeculture.com/tree-hive-colonies/** BC

Dill

Dill And Related Herbs As Bee Plants

Connie **Krochmal**

This article continues the series on herbs in the carrot/parsley family. Nearly 10 or so of these species are attractive to bees since they're especially rich sources of nectar and pollen. This time, we'll be considering dill, anise, and lovage.

Dill (*Anethrum graveolens)*

Originally native to Russia, the Middle East, and western Asia, dill was introduced to Europe where it naturalized. This herb is most popular in Eastern Europe, Poland, Scandinavia, and Russia. The common name apparently comes from an old Norse or Saxon word "Dillan," which means "to lull." This is in reference to the plant's traditional use to pacify crying babies and treat colic.

Dill was introduced commercially to North America later than the other European herbs. This bee plant brings both pollen and nectar.

Description of Dill

Although dill is a biennial, it is mostly grown as a hardy annual. The slender stemmed species is typically two to three feet in height, but can occasionally be shorter. It resembles fennel.

The small, pale green, delicate, feathery leaves are three to four times divided with finely cut, thread-like segments. These have a delicate fragrance. Flowering typically begins in the second year during mid-Summer. However, if it is planted early enough in the season, dill can bloom the first year.

The yellow blossoms feature petals that fold inwards. Dill flowers form wispy, flat clusters. The winged seeds ripen towards the end of the Summer.

Growing Dill

Easy to grow from seed, this herb self sows. Equally tolerant of heat and cold, it generally prefers full sun. However, dill does reasonably well in light shade. If possible, give this plant a protected spot for the stems tend to fall over in windy areas.

Space dill plants a foot apart with rows being two to three feet apart. The seeds can be stored for several years. When planting dill, leave these seeds uncovered. They sprout in about two weeks.

Dill can be direct sown or started indoors in peat pots. Direct sow seeds as soon as the ground can be worked in the Spring.

Transplant those started in pots once the soil has warmed. Avoid disturbing the roots during this process. Water as needed to keep the soil moist.

Dill prefers a slightly acid pH of 5.5 to 6.5. A reasonably rich, well drained soil is ideal. Potential problems include leaf spot, aphids, and caterpillars.

This herb can cross pollinate with fennel. For that reason, dill seed shouldn't be saved for planting if this herb grows near fennel. A large number of dill varieties are available to home gardeners.

For bee gardens, the quick blooming dill varieties are most suitable. Ones that are recommended include the following.

Bouquet dill is considered to be the very best choice for those planning to harvest dill seed. A very well known variety, the bushy, dwarf compact plant is generally two feet tall. However, it has been known to reach a little over three feet.

This variety bears greenish-blue foliage on slender stems. Bouquet dill is one of the earliest blooming varieties, bearing a crop of seeds 85 to 105 days or so from planting time. Typically, flowering lasts for several months. The blooms are yellow.

Long Island Mammoth dill has long been a popular variety. The quick maturing, vigorous plants bear finely cut green foliage. Plants are typically about four feet in height.

Less leafy than most dill varieties, Long Mammoth dill is one of the best for seed production. The yellow blooms begin opening in July.

Dukat dill is another favorite among gardeners. The vigorous, very leafy plant is particularly rich in essential oils. Quite finely cut, the foliage is greenish-blue with a mild flavor. Typically 1½ to two feet in height, these plants

can sometimes grow to three feet or more. This variety bears flower heads that are 10 inches across.

In addition to Dukat dill, an improved form called Super Dukat dill is also available. This variety is a great choice for bee gardens. Originating in Sweden, it is particularly rich in essential oil when compared to other dills.

Super Dukat dill is usually 1½ to three feet in height, although occasionally this has reached five feet. The plants mostly begin flowering from mid- Summer onward. Bearing seed heads that are uniform in height, these are ready for harvest about 90 to 110 days from the time the seeds are sown.

Fernleaf dill is a highly popular, unique, compact, dwarf dill. It grows to a little over 1½ feet in height and is almost equally wide. This variety is very suited to small gardens and containers. The branches arise at the base of the very ornamental plants.

Fernleaf dill was named as an All-America Selections winner when it was introduced some years ago. It is best suited to areas with long growing seasons since the plant tends to bloom a little later than some varieties. This dill is named for the very finely cut fern-like foliage. Seeds are typically ready to harvest about 95 to 115 days from planting time.

Using Dill

In ancient times, dill served various medicinal purposes. The ancient Romans included this herb in wreaths to honor Bacchus. It also showed up in their herbal remedies as well. They added dill leaves to cheese, soups, meats, and peas.

During the medieval era, people considered this to be a magical plant that could protect them from witches. At the same time, dill appeared in love potions.

This plant tastes somewhat like fennel. The flavor has been described as strong and warm. Generally, cooks now prefer fresh dill leaves rather than the dried.

The fresh and dried leaves are used to flavor fish, eggs, salads, vegetables, cottage cheese, potato salad, sauces, dumplings, mushrooms, sour cream, cakes, and other desserts. Both the leaves and seeds can be used as a flavoring, although the seeds are stronger tasting. The latter is equally good fresh or dried and are widely used in pickles and dill vinegar.

Anise

Anise (*Pimpinella anisum)*

This plant is also called aniseed. Originally native to Egypt where it was first cultivated, anise was later introduced to Arabia. The plant is mentioned in the Bible.

Historians disagree as to whether the plant was native to Europe or was introduced. Some sources credit the Romans with bringing this plant to the continent.

The plant was highly popular among the ancient Greeks and Romans. The latter used it to pay their taxes and as a flavoring for cakes. In Greece, it was widely used to flavor ouzo.

King Edward I placed an import tax on anise seed. Once anise was introduced to America, the plant naturalized in Michigan and Massachusetts.

An individual anise flower can provide from 0.05 to 0.08 mg of nectar daily. This herb has been known to yield a crop of surplus honey, especially in California, with over a hundred pounds per colony. Anise is also a source of pollen.

Description of Anise

This popular herb reaches 1½ to two feet in height. A sprawling, spreading annual, it features a rather weak stem that can be damaged by heavy winds. The dainty, lace-like, scented, broad, small leaves are deeply notched.

This plant bears large, crowded flower heads in early Summer. The blossoms are whitish-yellow to cream. The very small, hairy seeds are pale brown or brownish-gray.

Growing Anise

Grown from seed, anise is suitable for all zones. This sun loving, heat tolerant plant withstands light frost. It prefers a light, sandy, rich, well drained soil with a pH of 6.0 to 7.

Sow anise seeds 1/8 inch deep. These don't store well. When planting early indoors, use peat pots to minimize damage to the roots when the young plants are later transferred to the garden.

Anise can be direct sown once the danger of frost is past. Plants should be spaced 1½ feet apart in the garden.

Allow the soil to dry out slightly before watering anise. Although the plant experiences few insect problems, it is sometimes attacked by leaf spot and rust.

Uses for Anise

This plant is used as a flavoring. The taste is somewhat reminiscent of fennel, but is more delicate with hints of sweetness and spice. Anise is added to Italian sausage, candy, bread, cakes, cookies, soups, drinks, salads, and liqueurs. This is also used to flavor medicines.

Fresh anise leaves serve as a flavoring for meats and curries, and are made into tea. They can be harvested throughout the Summer. Sometimes, the foliage is dried for culinary purposes.

Anise blossoms are dried and ground and used as a flavoring for vermouth and certain types of wines.

The seeds are used to flavor foods. Their taste is similar to that of licorice. Strangely enough, dogs reportedly love anise, especially the seeds.

Lovage (*Levisticum officinale)*

Originally native to Iran, lovage was introduced to the Mediterranean region. Brought to America by the European colonists, the plant has naturalized in a number

Lovage

of states, including Colorado, New Mexico, Missouri, Minnesota, Wisconsin, Michigan, Ohio, Pennsylvania, New York, New Jersey, Vermont, Massachusetts, Connecticut, Rhode Island, and Maine.

The herb was very popular among the ancient Greeks and Romans as an herbal remedy. It also showed up in their love potions. The Romans were responsible for introducing the plant to England where it naturalized.

Lovage appeared on the lists of approved plants for Charlemagne's estates during the ninth century A.D. The plant was used widely during the Middle Ages and Renaissance for medicinal purposes. Certain magical powers were attributed to this plant.

Description of Lovage

This vigorous, stout perennial can be quite tall – from four to seven feet with a spread of two to three feet. This features erect, ribbed, hollow, fluted stems that divide at the top to produce a whorl of branches. The plant becomes larger every year until it reaches maturity at about four to five years of age.

Growing from a thick root, this is considered to be a very beautiful herb. It resembles angelica. The alternate, dark green, deeply divided, large, glossy leaves look much like those of carrots and celery. The flat, coarsely toothed leaf segments are broadly wedge shaped.

Lovage flowers appear from May to July. These can be greenish-white, yellow, or yellow-green. They're overflowing with nectar. The blossoms form four-inch-wide umbels. Bees are quite fond of lovage flowers, which are sources of nectar and pollen.

The seed heads split open when the seeds are ripe. The oval, aromatic, brownish-yellow seeds are 1/3 inch in length.

Growing Lovage

Easy to grow, lovage is one of those largely neglected, old-fashioned garden plants that have fallen by the wayside in the 21st century. This is a pity, since this perennial is especially suited to permaculture plantings. Adapted to sun and partial shade, the plant prefers a moist, rich soil. It is hardy in zones four and higher.

Both seeds and plants are available from various sources. This very care free plant is easy to grow from seed. Fresh seeds have a higher germination rate.

These sprout in about ten to 14 days. Plant them in Autumn as soon as the seeds ripen or in the Spring. Space the plants several feet apart.

Lovage can also be divided in the Spring when the plants are three to five years old. Sometimes, this herb can be attacked by aphids and leaf miners.

Uses for Lovage

In ancient times, the Greeks and Romans used lovage for culinary purposes as a seasoning, especially in salads. For Roman cooks, the seeds served as a substitute for black pepper.

This herb was widely used for cordials and beer until the early 19th century. Over time, it became less popular. The blanched stems and blanched leafstalks can be used much like asparagus.

The roots, leaves, lower stems, stalks, and seeds serve as a flavoring for salads and cooked dishes. These are also added to mayonnaise, soup, sauces, and cheese. All parts of the plant have been used as a vegetable and as a flavoring. BC

Connie Krochmal lives and writes about plants from her home in Kentucky.

Checking In

Ross **Conrad**

How often is enough?

I recently had a fairly new beekeeper ask me how often they should inspect their hive. Apparently there is plenty of information and advice out there on *how* to inspect a colony, but precious little on when or how often. This beekeeper was probably disappointed when I gave them the answer that is common for a wide variety of beekeeping questions…"It depends".

First of all, bees are not like most other animals we keep; they don't need daily attention. This is both a great benefit and one of the biggest challenges for most beekeepers. With dogs and cats, or farm animals, we tend to find it easy to get into the daily routine of regular animal chores. Since the honey bees' needs are not as consistent it is easier to forget, put off, or rationalize reasons not to check the hives. It is important to remember that while honey bees do not typically need daily attention, they do occasionally need it, and they need it when they need it. While a calendar may be able to give you a general idea of what a hive may need, it will not be definitive nor take into account specific and unique situations. It is the beekeeper's responsibility to be there for the bees when they need assistance. The only way to really know if a colony needs assistance is to look both at the outside activity around the hive entrance and inside the cavity evaluating what you see.

A quick check up on a hive might consist of taking a quick look at the bee activity around the entrance and then quickly looking under the inner cover and down between the frames to be sure that the colony's population seems normal, combs are being drawn out and filled with honey, and there is capped worker brood present. All this can be ascertained within a minute or so. Whenever things don't look right, then a closer inspection is called for, often requiring that frames be removed from the brood nest.

Activity at the entrance of the hive is only one clue as to the health and well-being of the colony within. To really know the status of a colony, you must look inside."

Time of year

One of the primary variables that will impact how often to check a hive is the time of year. During the height of spring when there is abundant forage available, check-ups are called for at least every seven to 10 days if you want to have a hope of staying on top of maintaining enough room to accommodate the rapid colony growth that is common at this time of year. Add more room (extra supers or top bars) *before* the bees have filled up all their combs with honey, pollen and brood and you will not only help to maximize your honey crop but may discourage the colony from swarming.

Experiencing a long dearth in nectar and/or pollen forage, perhaps due to drought or other seasonal conditions? It is still a good idea to keep tabs on the colony's condition but check-ups may safely be cut back to perhaps every two to three weeks until the dearth is over. You will want to catch any disease, pest, or nutritional issues before they get out of hand, and these occasional inspections will also help you confirm when the nectar starts flowing again.

Weather

Closely associated with the time of year is the weather. For the colony's benefit and for the beekeeper's maximum enjoyment of the bees, check-ups and more thorough inspections are best done when temperatures are over 60°F and it is not raining. Inevitably, there is going to come a time when the hives need inspecting but the weather is not cooperating. All you can do in situations like this is make the best of it. Keep inspections short, be sure your veil is tight, and use plenty of smoke. You can even open a hive when temperatures are freezing as long as it is quick, necessary, the cluster is not broken up in the process, and the bees don't get wet as a result of your inspection. I can't count the times I have saved a strong colony of 20,000-30,000 bees from starving to death in the dead of Winter. Even when temperatures are below freezing (32°F) and its not snowing or raining, I've had no problem slowly removing the inner cover, (even when covered with bees and placing it carefully and gently aside), putting a full super of honey on top of the hive and the inner cover back on top before replacing the outer cover. Life happens. Inspection schedules and hive checks must be kept flexible if they are going to work.

In order to avoid giving the bees too much room and inviting possible wax moth and small hive beetle problems, look inside the hive and only provide more space when the bees have mostly used up the space they have.

If everything is done right in autumn, winter check-ups can be kept to a minimum, perhaps once every couple months or so. Most of my winter inspections come after a big storm and consist of simply checking to be sure bees are not totally buried in snow with no ventilation, or tree limbs have not fallen and crushed a hive or flattened an electric fence. Then inspections may increase in frequency to once a month or so toward the end of winter when I like to take advantage of a late winter thaw to confirm colonies are still alive and have enough food reserves to keep them going until spring kicks in.

Goals

What you are trying to accomplish with your bees will play a decisive role in determining when you inspect your hives. As noted above, for honey production an inspection schedule of about every seven to 10 days is called for with weekly checks during times of heavy nectar flows, letting inspections stretch out to every 10 days or so when flows are not as strong.

Everything changes if you are conducting special hive manipulations. For example, when grafting and raising queens, or hoping a colony will raise their own queen from eggs or queen cells, inspections must be timed to accommodate the bee's schedule which can range anywhere from hours to weeks.

Condition of Colonies

Another variable that can greatly impact the inspection schedule is the health and condition of the colony. Weak hives struggling with disease, pest or nutrition issues for example, may need to be checked more frequently to confirm whether conditions have deteriorated, treatments need to be attended to, or feeders refilled or removed.

Hiving a package of bees or introducing a queen to a queen-less colony? Inspection times will need to be adjusted accordingly. Many beekeepers today will hive a package of bees and then insert the caged queen into the hive for a number of days before even removing the cover from the candy end of the cage. Once the cork is removed, there is usually a three day wait before the cage needs to be checked again to confirm that the queen has been released and accepted. Once released, a 10-14 day period is often provided before checking to see that all is progressing as it should.

On the other hand, a small colony that is otherwise queen-right, healthy, with plenty of food reserves, numerous empty combs to expand onto and a entrance reducer installed may only need bi-monthly inspections, especially if the nectar flow is weak.

The beekeeper's schedule and needs

The trick with honey bee colony inspections is to coordinate the timing to meet both the needs of the bees and the needs of the beekeeper. Our busy modern-day lifestyles can make it challenging to find time to check on hives. Good bee stewardship however, means that the beekeeper needs to make the time to inspect hives when attention is warranted, and we never know if attention is warranted until we check on the hives and have a good idea of what is happening inside the cavity we are providing as a home for our bees.

When inspecting a colony it is seldom necessary to take apart the brood nest. This is typically only done once in the beginning of spring to ensure that colonies have a healthy queen and no disease issues at the start of the season. After the initial in-depth inspection, the brood nest need only be inspected when there are signs of trouble and problems are suspected. For example when the colony's worker population appears low, or no capped worker brood is visible between the frames of the brood nest.

Beginners have a special need to build up their experience reading combs, handling the bees, their hive tool and smoker, all under varying conditions. Additionally, they usually have a strong curiosity about the bees and what is happening inside their hive, especially for the first few months after they get their bees. Therefore beginners should be encouraged to inspect a colony's brood nest more often than experienced beekeepers. After all, one can only learn so much from books, articles, workshops and online videos in the end the only way to truly learn beekeeping is to open up the hive and do it. BC

Ross will be teaching a two-day intensive, Getting Started in Organic Beekeeping class May 19 - 20, 2018 at the Metta Earth Institute in Lincoln, Vermont. For information visit ***http://www.dancingbeegardens.com/events.html*** *or call 802-349-4279.*

Pollen Traps – **$10** each
50 or more – **$5** each, FOB

Heat Exchanger, water heated with new tubes **$500** obo.

Call Zeller & Sons Honey
307.548.2818
queenbee@queenbeegardens.com

SIMPSON'S BEE SUPPLY
A Complete Line of Extracting Equipment
Formic Pro Strips
Classic Glass & Plastic Jars
4.9mm Plastic Drawn Comb Frames
4, 8, 16 oz. Muth Jars With Corks
Honey Filled Candy $65/case
15642 Tiger Valley Road
Danville, OH 43014
740.599.7914
cwsimpson@embarqmail.com
www.simpsonsbeesupply.com

If You Can't Afford To Take Care Of The Veterans Then Don't Go To War

---

Northern Survivor Queens

Trait Breeders –
Native American Beekeepers

Nuclous Colonies *$175*

Our Bees have survived in the foothills of Lake Champlain for the last 80 years

Singing Cedars Apiaries
Orwell Vermont 05760

1-802-948-2057
www.vtbees.com

Trees & shrubs to fit the nectar and pollen needs for your bees – Contact us for a free catalog today!

www.TreesForBees.com
(615) 841-3664 | RockBridgeTrees@gmail.com
199 Dry For Creek Rd | Bethpage, TN 37022

Bastin Honey Bee Farm

Delivering personal care and attention to every beekeeper!

- Packages
- Nucs
- Indiana Queens
- Boxes
- Frames
- Kits
- Tools
- Clothing
- Nutrition
- Bottles
- Extractors
- Classes
- Books

Apivar
BeeSmart
LYSON
Microbials

5002 W Co. Rd. 450 S
Knightstown, IN 46148
(765) 987-8385
www.bastinhoneybeefarm.com

The queen I am referring to is the president of the bee club. Of course, not all bee club presidents are female. Until fairly recent history, it was thought that the honey bee colony was presided over by a king, so our metaphor still works. All Hail the Queen, or King. Running a bee club takes an amazing amount of time, energy, and both hutzpah and humility. People automatically assume that the president is an expert beekeeper. This puts even more pressure on him or her. The new leader of my bee club, Four Corners Beekeepers, realized this and put some thought into it before putting her name in the hat at our last election. She took the title "Chair of the Board", to make it clear that she is not a bee expert, and that running a bee club should be a team effort rather than a one woman show. She has enough hutzpah to stand in front of a room full of people and run a meeting, and enough humility to ask for help with the nitty-gritty of beekeeper education, program ideas, and mentoring. We need to respect these brave souls who run our bee clubs.

In the same way that it appears that the queen keeps a bee hive running smoothly, but who is in actuality governed and guided by the workers who polish cells for eggs to be laid in, by the amount of royal jelly she is fed, and by the pheromones of the other residents of the hive, our bee club president appears to be ruling the bee club. There are many ways we can "polish the cells, or influence pheromone components" for our bee club queen or king, while maintaining respect for them and their position.

The first and most important thing a bee club member can do to improve the meetings is to be there. Even if the meeting topic sounds lame to you, attend anyway. Besides the meeting topic, there will be wide-ranging discussion about beekeeping. Most bee club meetings include Q & A. There is also time before and after the meeting when beekeepers are socializing. Imagine that you have a question about splitting your colonies this spring. You know your president is not a beekeeping expert, and the meeting speaker is not, either, so you think you will not bother going to the meeting. Too bad for you. Someone asks the very question you had in mind. Five people in the crowd talk about new techniques they have learned in the past couple of years, and everyone but you gets five new ideas to make their split more successful. Or, maybe you do not have a burning question. Maybe you are one of those five people who have an idea to help answer someone else's burning question. Even if you are the most experienced beekeeper in your club, if you attend the meetings and participate in events, you will learn something. I am always amazed by the creative ideas that people have, things I never would have thought of that might improve something that seemed fine, but now can be better.

What if your bee club meetings are *always* lame? Ideas for great meetings do not always Spring from the president's own head, you know. Your president needs communication from you. Maybe writing them a note saying "these are the topics I think meetings should cover this year," is not the best idea. It is easy for an experienced beekeeping president to forget what they needed to learn in their second or third year, and it is difficult for a newer beekeeper to imagine what they are going to need to learn this year. Feedback from the membership is often where good ideas for meetings come from. A note to the president that says, "I am wondering about..." or, "I need help learning how to..." helps them know what is needed. If your question is not addressed, be brave enough to raise your hand at the end of the meeting, and ask. I guarantee that there are others in the crowd that will thank you for being brave enough to speak.

Another area that courage from the membership would help is in asking *stupid* questions. There really are no stupid questions. I was with a small group of beekeepers recently when one admitted they had a stupid question. Every eye was instantly riveted on this brave soul, and as it turned out, half of the people in the group admitted to having the same stupid question, but no one had been brave enough to stand up at the meeting and ask. Half the people at our recent meeting probably had the same question. What a shame. Be brave! You will be thanked for it.

Volunteering to help with events is a great way to increase educational opportunities in your club. Beekeepers who read a lot are the most successful. A bee book club helps promote self-education among the members. Meeting outside the regular bee club meeting to discuss a chapter of the chosen book provides great opportunities to also discuss goings-on in the beeyard. You don't even need to choose a book. Getting together to discuss the contents of *Bee Culture* can be a great way to get people started in the good habit of reading about bees.

Beth at travelling show.

You do not need to be an expert beekeeper to teach new-bees, either. Contact your president and volunteer (are you starting to notice a pattern here?) to invite the bee club over to your apiary next time you do a powdered sugar roll for mites, split a colony, or even for just a routine inspection. Practice that balance of hutzpah and humility. Ask how others in the crowd have done it. You might learn something at the same time you help others.

Helping find speakers for meetings might be a way you could take a load off of the president. Contact your president with your idea for a topic. Suggest a name or two of people who might be able to address this topic. Volunteer to contact the potential speaker. Most bee clubs charge a small membership fee. This really adds up over time, and there is no better way to spend that money than on education of the membership. As an example, you would like to learn more about diagnosing and treating bee diseases. No one in your club has the expertise you need. Is there a commercial beekeeper within 100 miles? Call them up and volunteer to pay for their gas and a small speaker fee. Or, is there a state or local apiary inspector? Invite them to speak. Write to your state's University extension program. Maybe a neighboring state has an apiary inspector you could recruit for this talk. Be creative and never give up. Here in Colorado we do not have an apiary inspection program, nor does our University extension have a very robust beekeeping program. But, there is an apiary inspector in the state of Utah. We could probably get him to come give us a talk for $200. If your club does not have the funds, charge a small fee. If 20 people attend and pay $10 each, you have it covered.

Mite management is crucial to bee survival. Even if your club is dedicated to treatment free beekeeping, mites must be addressed with Integrated Pest Management. If this issue is not being addressed, one thing you as a member could do is to contact your president and volunteer (there's that pattern again) to form a study group that will research this topic and share what you have learned at the next meeting. This idea can work for any topic. Most presidents will welcome the help and expertise that will be gained through this.

Just as the president should not hold the sole responsibility in making things happen at the bee club, one member does not need to hold the sole responsibility in volunteering for everything all the time. If someone in your club has a gift or knowledge that could be shared, they may not even realize it. Mention to the president that Joe Blow has a cool method for putting woodenware together and having everything come out square, maybe we could get him to do a little demo. Most often in my past presidency, volunteers were few and far between. Recruitment, though, is very effective. People think someone else will step up. Or, they do not realize that they have something of value to share. Most people feel honored to be asked to help with something at the bee club, so ask!

Probably the toughest situation a bee club can face is the president who has the hutzpah, but not the humility, to do the job. This person runs for the presidency, and let's admit it, everyone is grateful for someone else to do all that work. Once they are president, it becomes evident that they love to hear themselves speak, are not an experienced beekeeper, or worse, they are a bad beekeeper who doesn't know it. They never invite or allow anyone else to be the speaker at meetings. They never ask for help, never ask questions of others, and refuse to entertain ideas like bee book clubs or apiary visits run by anyone besides themselves. They might even keep certain topics from being addressed in Q & A time. Someone who cares is going to have to gain enough hutzpah of their own to run for president. In the meantime, you could stand up at the end of the monthly meeting and announce that you would like to start a discussion or study group on a particular topic. There may be a sub-set of people in the club who have interests in line with your own. Keeping in mind the goal of increasing the education available to the members of the bee club will help keep this from becoming a personal rivalry.

Probably the most important thing to remember if you want to help improve your bee club is that the other people are just like you. They have the same *stupid* questions, struggle with the same challenges in hive management, and need answers just the same as you. Even the president is the same as you. Just like you, they will welcome assistance and ideas if presented respectfully. Finally, the president is just like you in the need for reassurance. Good words make the world go 'round. If your president is doing something well, send them a note and say thanks! If you have the perfect bee club president, those good words will help keep the King or Queen on the throne, and if you do not have the perfect bee club president, your positivity will encourage more good work. All Hail the Queen! (or King). BC

Tina has been hooked on beekeeping since 2007 in top bar, Langstroth, and more recently, the long Langstroth hive. She is founder of the Four Corners Beekeepers Assn, and vice president of the CO State Beekeepers Assn.

MY STORY – 2 Full Days, Four Successful Commercial Beekeepers Telling You Their Story. October 19-21, 2018 in *Bee Culture's* Conference Room, 640 West Liberty Street, Medina, Ohio.

Bret Adee • Mike Palmer • John Miller • Ray Olivarez

WORLD BEE DAY

May 20th! Celebrate!

Ann **Chilcott**

World Bee Day? Yes, it's official. On the 20th December 2017 the United Nations (UN) General Assembly adopted a resolution declaring 20th May World Bee Day. Every year on this day the global public will have their attention focussed on the importance of preserving honey bees and all other pollinators, and people will be reminded of the significance of bees in providing for the needs of humanity. They will also be invited to take positive action to preserve and protect pollinators.

All UN member states supported the resolution with 115 states effectively becoming co-sponsors. These countries include: USA; Canada; China; Russia; Brazil; Argentina; Australia; India and all European Union (EU) members.

Along with many other leading world figures, Pope Francis 1., current Pope of the Roman Catholic Church, declared that he welcomed the World Bee Day initiative which is all about raising awareness of the importance of bees and apicultural products. It is about protecting and supporting bees alongside the beekeeping sector. Equally important is actively contributing towards alleviating global poverty and eradicating hunger whilst preserving a healthy environment and its biodiversity.

The idea for a World Bee Day was conceived at 06:30 hours on 15th September 2014. Slovenian beekeeper Bostjan Noc was driving to work at The Slovenian Beekeeper's Association where he is president, listening to a radio programme about World Days and their meaning and he wondered why bees didn't have their own day. Considering that every third spoonful of the world's food relies on bees and other pollinators, and that bees are increasingly endangered and almost no longer able to survive without human interventions and support, it seemed only right that the global public should be made aware.

It took a tremendous amount of work and effort to make it happen but, with the support of Slovenian beekeepers and government departments, three years later Bostjan's seemingly unattainable goal was achieved.

Placed in the center of Europe and sharing borders with Italy, Austria, Croatia and Hungary, Slovenia is one of the top beekeeping countries in the world with every 200th inhabitant a beekeeper. For tens of thousands of Slovenian citizens beekeeping is a way of life with a very long tradition and its importance is also seen in the beautifully painted hives which are commonplace in that country. This country is home to *Apis mellifera carnica,* the Carniolan bee which developed 10,000 years ago in the valleys of the Karavanke mountain range on both sides of the border between Austria and Slovenia.

Slovenia became one of the first countries in the EU to prohibit the use of certain pesticides harmful to bees, which reflects the genuine respect for bees at all levels, from government down, in that country.

May was the chosen month for World Bee Day because in the northern hemisphere the need for pollination is greatest during that period, whilst in the southern hemisphere it is a time for harvesting honey and bee products. The Slovenians honoured their national beekeeping "treasure" Anton Janša (1734-1773) by choosing his birthday, May 20th, to celebrate World Bee Day.

Janša was a pioneer of modern beekeeping and one of the greatest experts of his time. Appointed by Austrian empress Maria Theresa in 1770 to prestigious employment as the imperial and royal beekeeping teacher based at a new beekeeping school in Vienna, Janša became the first beekeeping teacher in the world. His teaching remit also involved travelling around the country. He shared his knowledge of bees through writing beekeeping books

Traditional painted Slovenian beehives. photo by Matic Stojs

Carniolan honey bees.

and his students followed his teachings in various new beekeeping schools which were set up throughout Austria.

It was common practice at that time to kill off most of the bee colonies before Winter and then harvest their honey, but Janša wrote in one of his books, "I do not kill bees to get honey and wax. I keep them strong and healthy, so they will bring me honey again next year."

We have come full cycle back to focussing on sustainable living and I'm certain that Janša would approve of our endeavours.

What will you do to celebrate World Bee Day this year?

I'm contemplating making a honey cake and inviting friends round to raise funds for *Bees for Development* which is a charity based in Wales, UK, that has been working tirelessly for 25 years to promote beekeeping to combat poverty and protect biodiversity. Bees can give people the means to pay for food, and their children's education, and to improve their land and crop yields. In the past two years 650 people in Ethiopia have been trained in beekeeping by this charity that relies on donations from the public. In the USA, Megan Denver of Hudson Valley Bee Supply is the American representative for Bees for Development and donations may be made via **megan@hudsonvalleybeesupply.com**

I shall be making a light honey sponge cake with rich Italian marscapone cream cheese. Ideally chestnut honey is chosen because of its rich nutty flavour but, with it being hard to obtain in the Scottish Highlands, I shall be going for something different like a heather/ragwort mixture. Any flavoursome honey will do.

Alternative suggestions for celebrating World Bee Day:

- Plant bee-friendly shrubs or flowers in your garden
- Make some homes for bumble bees and solitary bees
- Talk to at least 10 people about bees during the day
- Dress up as a bee/wear clothes with bee motifs
- Support a beekeeping/environmental charity
- Organise a bee joke competition
- Alert all your contacts on social media to World Bee Awareness Day

Have fun. BC

Painted hive depicting the beauty of rural Slovenia. photo by Matic Stojs.

For more information contact: **www.worldbeeday.org**
www.beesfordevelopment.org
USA Donations via **megan@hudsonvalleybeesupply.com**
www.bumblebee.org (making bumble bee homes)
www.fs.fed.us/wildflowers/pollinators/gardening.shtml (gardening for bees)

Light Honey Sponge Cake with Marscapone

Recipe for making a 20cm/8inch cake:
Butter for greasing
4 medium sized eggs at room temperature
150g/4oz superfine sugar
90g/3oz honey
150g/5oz self-rising flour
2 tsp butter melted in 2 tbsp hot water.
Topping
500g/1lb marscapone
2.5 tbsp honey

Preheat the oven to 175˚C/350˚F. Grease a 20cm/8inch diameter deep sponge tin with butter.

Beat the eggs and sugar till pale, fluffy and doubled in volume and the sugar is dissolved. Continue beating and slowly pour in the honey in a continuous stream.

Sift the flour twice then sift again into the egg and honey mixture. Fold in quickly with a metal spoon then fold in the butter and hot water.

Pour the mixture into the sponge tin. Bake for 20-25 mins until the sponge is a rich golden brown and an inserted skewer or pointed knife comes out clean. Allow to cool for five to eight mins before turning out onto a cooling rack.

To make the topping, mix the marscapone and two tablespoons of honey together.

When the sponge is cool, slice it horizontally with a bread knife. Place the base on a serving plate and spread it with half the marscapone mixture. Replace the top and spread with the remainder of the mixture. To decorate, drizzle the remaining honey over the top to create swirls.

CALENDAR

♦INTERNATIONAL♦

World Bee Day May 20 in Slovenia.

For information and applications contact **info@apiroutes.com**.

♦COLORADO♦

The CO State Beekeepers Association Summer Bee College will be held June 8-9 at the Garfield County Fairgrounds in Rifle.

Speakers will be Sam Ramsey and Bill Collins. There will be a cookout and a banquet. Bring your veil.

For details and registration visit **www.Coloradobeekeepers.org**.

♦CONNECTICUT♦

CT Beekeepers Association will hold Supering and Inspection Workshop, May 5 at Massaro Farm, Woodbridge, 9:00-10:30 a.m. or 11:30 a.m. - 1:00 p.m.

Bee Talks May 10, 6:30 - 8:00 p.m. at Rockfall Foundation, 27 Washington Street, Middletown.

Nucleus Hives and Summer Management Workshop, May 19, 9:00 - 10;30 a.m.; 11:30 a.m. - 1:00 p.m. at Massaro, Woodbridge.

For information contact Steve Dinsmore, 860.949.5924 or **SDINSMOR@gdeb.com**.

Back Yard Beekeepers – each month hands on inspection workshops, bee school, mentor program and more.

Speakers include May 22, Peter Borst; June 26, Dinner meeting; September 25, Richard Coles; October 30, Dewey Caron; November 27, Bill Hesbach.

For information **visit www.backyardbeekeepers.com**.

♦GEORGIA♦

UGA / Young Harris Beekeeping Institute, May 9-11 at Young Harris College, Young Harris Georgia

The most comprehensive (and fun) beekeeping event in the Southeast. Includes lectures, workshops and demonstrations from local, national, and international speakers. Plus hands on beekeeping training, the Georgia Master Beekeeping Certification Program, Welsh Honey Judging Classes and International Honey Show.

For information please visit **www.ent.uga.edu/bees**.

♦KANSAS♦

Northeastern Kansas Beekeepers 2018 Funday June 2 at the Douglas County Fairgrounds in Lawrence. This is a special day to honor Dr. Orley Taylor.

Chip Taylor's grad students will be speakers – Marla Spivak, Mark Winston, Gard Otis, Jose Villa and David Roubik and others.

For information visit **www.NEKBA.org** or contact Joli Winer, 913.593.3562 or **joli@heartlandhoney.com**.

♦MASSACHUSETTS♦

Mass Bee Field Day June 16 at UMASS Agricultural Learning Center, UMASS Amherst

For information visit **www.massbee.com**.

♦OHIO♦

Queen Right Colonies Annual Field Day, June 2 starting at 9:30 a.m. 43655 State Route 162, Spencer.

For information visit **www.loraincountybeekeepers.org.**

♦PENNSYLVANIA♦

The Capital Area Beekeepers' Association will hold its 31st Annual Short Course, May 5 and 12. Part 1 at the Dauphin County Agriculture & Natural Resources Center in Dauphin starting at 8:00 a.m. and Part 2 starting at non at Strites Orchard, 1000 Strites Road, Harrisburg.

The cost is $50 which includes membership and the book, *Fundamentals of Beekeeping.*

For additional information visit **cabapa.org** or contact John Novinger, 717.365.3215 or **jdnovinger@epix.net**.

Queen Rearing Classes May 12-13, 9:00 a.m. - 4:00 p.m. and May 22, 6-8:00 p.m. at Delaware Valley University, Doylestown, Feldman Bldg. Room 122.

The cost is $219/person and Vincent Aloyo is the instructor.

For information and to register visit **www.delval.edu/continuing-and-professional-studies/non-credit-certificates-and-courses**.

♦VIRGINIA♦

Children and Bees - A Family Event May 5. Classes take place at Spikenard Honeybee Sanctuary in Floyd, VA.

Principles & Practices of Biodynamic Beekeeping - Part 3: Spring and Summer Hands-on guidance, May 19. Classes take place at Spikenard Honeybee Sanctuary in Floyd, VA.

Sustainable/Biodynamic Beekeeper Training May 24-26. Classes take place at Spikenard Honeybee Sanctuary in Floyd, VA.

For more information on all of classes visit **www.spikenardfarm.org or contact: info@spikenardfarm.org** or 540-745-2153.

Virginia State Beekeepers Association 100th Birthday Celebration, June 15-16 at Roanoke College.

Speakers include Tom Seeley, Kirstin Traynor, Dewey Caron and Jennifer Kern.

For information visit **www.virginiabeekeepers.org/vsba-100th-anniversary-meeting**.

♦WASHINGTON♦

WSU Queen Rearing and Bee Breeding Workshop, Pullman, June 15-16. For those of you who already have a working foundation in beekeeping.

Instructors include Susan Cobey, Jennifer Han, Brandon Hopkins, Melanie Kirby, Tim Lawrence, nick Naeger and Steve Sheppard.

Registration is $275/person, $450/couple

For more information visit **www.bees.wsu.edu**.

♦WEST VIRGINIA♦

The Dan O'Hanlon School of Instrumental Insemination will be held June 25-27 at Cedar Lakes Conference Center, Ripley.

Tuition is $500. The class is for beginners.

Trainer is Dorothey Morgan assisted by Zelma Boggess and other breeders from the WV Queen producers, aka Mountain State Queens.

For information contact Zelma Boggess at **z_boggess@yahoo.com.**

Display Advertisers

If you are having an annual meeting or teaching a beginning beekeeping class, we are happy to send you magazines to give to your attendees and students. BUT – we need to receive your request four weeks before your event so that we have time to process your request. Please email Amanda at Amanda@BeeCulture.com with the number of magazines needed, a complete mailing address and a contact person.

Paul extracts honey for me, so I don't have to get my fingers all sticky. Last September I took most of my 2017 honey in five-gallon buckets. But Tommy, who did the extracting, drew off about 1,300 pounds into two 55-gallon drums. I don't remember why.

I left those two barrels in Paul's honey house, thinking I'd deal with them later. Now it's March, and the honey buckets stacked in our living room have largely disappeared. Things do get moved around in Paul's honey house, so I thought I'd better at least locate those two barrels, before I really need them.

I looked in Paul's new honey house, and I looked in the old honey house, and I couldn't find my honey. Josh was mopping the floor in the bottling room when I found him. He had no idea where my honey was, so we talked about skiing.

The next day I called Paul's right-hand-man Derrick in California. I wasn't even thinking about those two drums when I picked up the phone. Derrick takes care of my bees in the almonds, and now it's time to bring them home. I wanted a couple of pallets dropped off in Palisade, Colorado, for my sweet cherry pollination customers, and the rest sent to Paul's holding yard in Rulison.

This year the almond blossoms froze, some of them, but Derrick said the bees in his care look "really good." Derrick's been feeding them syrup and pollen patties. He said some were still making delicious bitter almond honey.

There's a lesson here. Did you catch it? Nothing cuts off a honey flow like a visit from Jack Frost. Yet despite significant freeze damage, Derrick's bees look strong coming out of the almonds. Sometimes when Mother Nature cuts us short, pro-active bee husbandry can make up the difference.

I was about to hang up when I remembered the missing honey. "Oh, yeah," Derrick said, "I remember those two drums with your name on them, but I thought you sold them to Paul. We sold those (wholesale) last Fall."

Paul's on a fishing trip, and I don't want to bug him. He'll be back, and we'll figure something out.

Yesterday I skied Aspen Mountain with my chiropractor. Andi trades spinal adjustments and massage for Colby Farms lamb, beef, grape juice, honey, eggs – whatever we have. She administers her magic touch on me and my gal Marilyn both. I feel like Andi's undercharging us, so I try to treat her right. She's a very competent skier, but rock climbing, not skiing, is her thing. Andi's not a physically imposing person. Her muscles don't exactly ripple, but she climbs all the hard routes. When I asked how she manages to hang on like a spider on the wall, she said, "It's all about balance, Ed."

My bum knee felt pretty good on the ski hill yesterday. I've been getting a series of lubricating "rooster comb" injections in that knee. I don't want it buckling under me when I've got a brood super in my hands in the beeyard. The shots are like getting the joints in my car greased, except I don't have a grease zirc in my knee. I've gotten these injections before. They make me feel young again. Like youth itself, however, it's only temporary.

A lot of people think my rooster-comb doctor was an astronaut once-upon-a-time, but what he really did was study the metabolic effect of space walking, especially astronaut overexertion and overheating in the primitive Gemini spacesuits. He's a gentle soul who always asks about my bees.

Did you watch the Pyeongchang Olympics? Colorado skier Alice McKennis took fifth in the downhill. The little darling! Alice eats my honey. She grew up just down the road, and she's one of the brightest stars on the World Cup circuit, when she's not busted up. Her sister owns one of my beeyards, and when Alice's cowboy brother-in-law stopped by the house to pick up the honey yard rent, he said, "Ed, we really appreciate the honey, especially Alice. She eats most of it." Good. Now I have a racer to root for!

Last Spring a gentleman bought a couple of nucs from me. He e-mailed me today, asking if I would make more nucs for him, using foundation from "two-chamber Slovenian" hives that he would provide. I see a couple of problems here. One is that the Slovenian frames are taller and shorter than Langstroth, so they won't fit in my Langstroth hives. The second is that nucs are made by pulling drawn comb – filled with eggs, brood, pollen and honey – from mature colonies, and then adding a new queen. So even if his Slovenian foundation frames did fit my Langstroth hives, they'd still have to get drawn out by the bees before they could get filled with bee food, eggs and brood. This could take forever.

Slovenian hives? This is like building a house right here in the United States but out of lumber cut to European metric specifications. I suppose you could do it, but why would you?

And he's a relatively inexperienced beekeeper. Learning enough about bees to keep the little darlings alive is already a daunting task. I say keep it simple.

I like the guy. To succeed, you sometimes first have to fail. I'll sell him some Langstroth nucs, if he wants them. But then he's on his own.

Ed **Colby**

Balance

Blue Sky bee supply®

PROVAP 110 OXALIC ACID VAPORIZER
#PVOV- $485.00

EASY CHECK MITE COUNTER
$D4209 - $20.00

REUSABLE BEETLE TRAPS
#RBT - $4.50

MITE AWAY QUICK STRIPS
#MAQS-4 - $12.95/4 PADS TREATS 2 HIVES
#MAQS-20 - $49.95/20 PADS TREATS 10 HIVES
#MAQS-50 - $109.95/50 PADS TREATS 25 HIVES

FORMIC PRO
#FPRO-4 - $14.65/4 PADS TREATS 2 HIVES
#FPRO-20 - $55.95/20 PADS TREATS 10 HIVES
#FPRO-50 - $115.75/50 PADS TREATS 25 HIVES

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

BE PREPARED
FOR THE HONEY FLOW

HK-190

HK-210

FULLY ASSEMBLED

Our Hive and Super kits come precision cut and assembled so that you can be ready for the honey flow. Pre-Built Kits, HK-190 & HK-210, come with our Assembled Wood Frames with Natural Color, Waxed Rite-Cell® Foundation.

READY TO GO

HK-190 Hive Kit - Painted - Wooden Frames **$57.95**

HK-210 Super Kit - Painted - Wooden Frames **$52.95**

Mann Lake Ltd. FREE SHIPPING Mann Lake Ltd.

MANN LAKE
WE KNOW BEES
An Employee Owned Company

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 are subject to change without notice.