POLLINATOR GARDENS

ROOT PUBLICATIONS

JUN 2018

Catch The Buzz™

Bee Culture®

The Magazine Of American Beekeeping

www.BeeCulture.com

THE HIVE MIND

ENOUGH SLEEP?

INTO THE FUTURE

ROOT PUBLICATIONS $4.99

HONEY SUPERS

THE FIRST STEP TO HARVESTING YOUR HONEY

Complete Supers

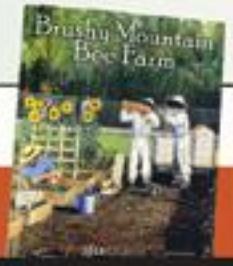
Supers w/ Assembled Superframes

Starting at $49.00

Also Available Pre-Painted

NO WIRING *OR* SUPPORT PINS NEEDED | ***ALLOWS BEES TO* BUILD FASTER** | **MORE ROOM FOR *NATURAL BEESWAX***

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

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


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
✳ California State Beekeepers Association
✳ Minnesota Honey Producers Association
✳ North Dakota Beekeepers Association
✳ American Honey Producers Association
✳ Florida State Beekeepers Association
✳ Montana State Beekeepers Association
✳ Texas Beekeepers Association
Kevin Rader: Buzzus@beekeepingins.com
www.beekeepingins.com
888-537-7088

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

KONA QUEEN HAWAII

Italian and Carniolan Queens
$2.00 Off in July & August
for shipments of 100 or more

Not all Queens from Hawaii are the Same

Call Now to Reserve
(808) 328-9016

Shipping Included on Orders of 100 or More
Minimum Order of 12 Queens
Live Delivery Guaranteed

KONA QUEEN HAWAII

Bee Culture

June Features . . .

Page 56

Page 35

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), June 2018, Volume 146, Issue 6, is published monthly by The A.I. Root Co., 623 W. Liberty Street, Medina, OH 44256. Periodicals Postage Paid at Medina, OH and additional mailing offices.

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

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

A.I. Root pollinator gardens. Flottum photo.

Build stronger colonies in 2018!

> **"The population increases rapidly and honey production increased. On average production per hive is approximately 25% more and the hives are more consistent in the production."**
>
> Donald Tweeddale (20,000 hives in New Zealand)

Less than **$1** per hive

The scientifically validated benefits of HiveAlive™

- **+35% increase** in amount of brood[1]
- **+89% increase** in colony population in spring[2]
- **Intestinal well-being** Healthy colonies
- **Increase in honey** production[1]

[1] Increase in honeybee populations with continued use of HiveAlive™, Results from long-term field trials, France 2014-2015, Trial conducted by Véto-pharma, France. [2]Charistos, L, Parashos, N & Hatjina, F (2015) Long term effects of a food supplement HiveAlive™ on honey bee colony strength and Nosema ceranae spore counts, Journal of Apicultural Research

Available in the US from:

MANN LAKE
WE KNOW BEES
An Employee Owned Company

Contact:
Frederick Proni, North America Area Manager
214-675-7464 or frederick.proni@vetopharma.com

HAV-25-US-N01-04/18

Check out our other solutions to support honey bee health:

Apivar® By Véto-pharma
varroa easyCheck By Véto-pharma
ApiLifeVar

Véto-pharma
Committed to apiculture

Bee Culture's Best . . .

Page 69

In Every Month –

BLYTHEWOOD BEE CO.

WWW.BLYTHEWOODBEECOMPANY.COM

DON'T JUST BUY'EM GET SWARMED!

Catch Swarms Faster With The
#1 Honey Bee Swarm Lure In America

Whether you need help luring in feral swarms of honeybees or top quality beekeeper tools, Blythewood Bee Co. has all the supplies you need. Our extensive online catalog includes all Swarm Commander products - a proprietary blend of oils that mimics the natural pheromone "Nasonov" that attracts working honeybees. Visit us today!

DEALER INQUIRIES WELCOMED

WWW.BLYTHEWOODBEECOMPANY.COM

Sudden Fall Collapse

I have a hypothesis. It came to me from observations and recent research.

The hypothesis is – sudden Fall collapse is not caused by an influx of mites but of disease carrying bees from collapsed or collapsing hives. The mites will eventually cause issues later, but not immediately.

Here is what led me there.

Three years ago I lost a hive early in the Fall. The autopsy showed *Varroa* was the probable cause, but I had used MAQS and thought all was well with low mite counts. It had been a strong hive, so I attributed the death to "mite bombs". There was a no-treat beekeeper very near me and they lost their bees every year, so I thought my bees robbed the hives and brought back the mites.

Two years ago in the late Fall I noticed diseased bees on the carpet I put in front of my hives to see what they are throwing out. I knew they were suffering from *Varroa*, but, again, I had treated only a month before with MAQS. I was not happy with MAQS, so bought an Oxalic Acid Vaporizer but was not intending to use it until the next year. With the obvious *Varroa* signs, I treated with OAV three times five days apart and the hive made it through the Winter, in fact it is still going strong.

After every OAV treatment I put in a sticky board to measure actual mite drop. Last year I treated in March, then June after splits, and early August after my first extraction. Sticky board mite drops were less than 10 every time and usually one to four at most. Please note that these are not alcohol washes but the actual mites that are killed after the OAV treatment. I would have had zero with an alcohol wash. All was good going into the winter.

My epiphany came this past fall. In late September I saw major "robbing" in my apiary. But these were hives that should have been robbing other hives and not being robbed. They were strong and mite and disease free.

A few weeks later, I decided to treat with OAV again and the mite drop went from near zero to over 600. Plus there were dead bees in front of the hive, just like the year before.

At first I counted it as a "mite bomb", which it seemed to be, but it got me to thinking. 600 plus mites in the whole hive are not going to kill a hive suddenly. They will over a winter, but not in a month or so. Nor will there be such a sudden increase in dead, diseased bees in front of the hive.

A recent study showed that collapsed or collapsing hives spread their diseased bees all over the area. What if the "robbers" were not robbers but invaders? Either would elicit the same response, which is my hives fighting them off. The invaders would be infected by the *Varroa* they carried, so 600 plus infected bees came into my colonies and started transmitting their infections directly to the other bees, without having to go through the mite as a middleman. It is fairly well known that bees can transmit virus as can *Varroa*. In fact, you can kill off all the *Varroa* in a colony, but if the virus in the bees has passed a threshold, the hive will still die. It is also known that there can be different levels of infection in a hive, so you can have different responses to the introduced virus, for a rapid buildup to lesser impacts.

For me, it just did not make sense that a sudden mite infestation would cause sudden collapse. It would take too long to go from even 600 mites to what would cause a collapse in a month or so. They would eventually cause issues, including mid or late Winter death, or the bees would get through the winter, but weak and sickly. But it would not cause a sudden collapse. However, an influx of diseased bees would do just that by their immediate contact with other bees in the colony and the easy spread of the infection.

Hence my hypothesis, that it is the invader bees that are causing sudden collapse. The invaders carry high viral loads. Those bees come from collapsed or collapsing colonies and the only ones like that in my area are from no-treatment beekeepers. They continually lose most, if not all of their bees every year. The saving grace is that we are down to only a few in the area

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

because it just gets too expensive for them to keep buying packages.

To protect my bees I now mentor three beekeepers near me so we can control *Varroa*. We are now treating in October and will install robbing screens this year. We also check for new hives in the area to bring others on board.

I presented my hypothesis to several exceptionally experienced beekeepers who are well known nationally and they see merit in it, so I am passing it on to you.

Remember- it is a hypothesis, which is the scientific term for a good guess.

Bill Truesdell
Bath, Maine

HAS Registration

The deadline to register for Heartland Apicultural Society's (HAS) annual conference July 11-13, 2018 at Washington University in St. Louis, Missouri is Wednesday, June 20, 2018 at **www.heartlandbees.org**.

Established in 2001 by several professional entomologists, the conference rotates through the Midwest offering beekeeping classes to make it easier for local beekeepers to attend sessions focused on the latest beekeeping methods and research.

The three-day conference includes keynote speakers as well as hands-on apiary demonstrations, queen rearing sessions and beginning and advanced beekeeping classes. The conference will also include organized evening events including a Mexican dinner and live music and free movie night on Wednesday, July 11; a tour

Get Connected
with Kelley Beekeeping!

- **Visit kelleybees.com to save** money with our Buzzworthy Buys and Smoking Hot Sales!
- **Sign up** for our monthly newsletter
- **Stop by our blog**
- **Visit our social channels** to stay updated with the latest information from Kelley Beekeeping
- **Leave us a review** on our Facebook or Google business page

Serving the beekeeper since 1924

Kelley Beekeeping

SERVING THE BEEKEEPER SINCE 1924

1-800-233-2899

www.kelleybees.com

807 West Main St., Clarkson, KY 42726

and buffet dinner at the Anheuser Busch Brewery Thursday, July 12 and a private dinner and tour of the insectarium at St. Louis Zoo Friday, July 13.

The University of Missouri Bee Squad, an instructional beekeeping program will provide beginning and advanced classroom and apiary instruction.

Confirmed conference speakers include Dr. Marla Spivak, a MacArthur Fellow at the University of Minnesota's Bee Lab; Dr. Keith Delaplane, Director of the University of Georgia Honey Bee Program; Dr. Dennis vanEngelsdorp, University of Maryland Honeybee Lab, who directs the Bee Informed Partnership, the Tech Transfer Program and the annual national beekeeping management surveys; Dr. May Berenbaum, Entomology department head at University of Illinois Champaign-Urbana, whose research focuses on the chemical interactions between herbivorous insects and their host-plants; Jennifer Berry, University of Georgia Honey Bee program lab manager and Samuel Ramsey, University of Maryland PhD candidate and researcher.

Other national, regional and local beekeeping experts will also be participating in the conference.

Hope to see you in St. Louis July 11-13, 2018!

Debbie Seib
Treasurer, HAS

Honey Tasting

The Honey and Pollination Center has been very interested in the series of articles about honey tasting that have appeared in Bee Culture over the past few years. We recognize the need to educate our beekeepers, packers and consumers in the unique characteristics of many of our more common mono-floral honeys.

In 2014, the Center convened a 26 member tasting panel to develop the UC Davis Honey Flavor and Aroma Wheel. The concept was to use the panel to taste a variety of honeys and to establish a series of terms that were used consistently to describe honey. The goal was to develop a tool to help consumers of honey have a broader and educated vocabulary when describing individual honeys. After several months of work with sensory scientists, the Center published its wheel to much acclaim. Over 99 words appear on the wheel divided into several traditional categories. The Wheel is copyrighted and proceeds from its sale go to graduate research in the Department of Entomology and Nematology. (*Bee Culture* – November 2014)

To quote the most recent article from *Bee Culture*, January 2018, Marina Marchese says: "We (the United States) have also not done the work here (as they have in Italy) on how honey conforms to

particular floral sources – meaning, nobody has done the complete pollen and chemical analysis of enough samples of any particular honey to be able to definitively say 'This is goldenrod honey' or 'this is orange blossom honey.'

In fact, this research has begun at UC Davis. This past year, 2017, working with UC Davis Departments of Food Science and Technology and Viticulture and Enology, the Center began the work of establishing sensory baselines for U.S. mono-floral honeys.

For the initial portion of the program, we trained and calibrated 10 professional tasters in the nuances of honey. We created the tools and protocols necessary for a formal program based on standard research procedures. The preliminary research uses three selected honeys with multiple samples of each. To back up this three month project, we had our palynologist meet with Dr. Vaughn Bryant at Texas A & M, Professor of Anthropology and an outstanding melissopalynologist, to learn how to

analyze honey for pollen sources. In addition, we had graduate students run instrumentation analyses in both nutrition and gas chromatography for aromas on each of our honey samples. Finally, we hope to add nuclear magnetic resonance (NMR) to our study within this academic year.

We are writing our initial results for publication in a peer reviewed food science journal and hope to have an article ready for publication simultaneously. Once these articles are complete we will begin the longer process of searching for financial support from within the honey industry and applying for grants to cover the extensive costs associated with this type of in-depth research.

Once funded, we are looking towards some very sweet research.

Amina Harris
Director, Honey and Pollination Center
Robert Mondavis Institute for Wine and Food Science, UC Davis

Loves Bee Culture

I just had to send this picture to you! This issue of *Bee Culture* is one of my favorites, although I love them all! You have been so generous to our SCBA association, sending us extra copies for our October fire victims and then again in February when you published the article by Ettamarie about our phenomenal cluster groups. I am going to make a special announcement about Bee Culture magazine at our next meeting and just wanted to tell you both how thankful I am for the wealth of information you select for each issue. I make a lot of presentations at schools for all age groups and next week will be on Bee Math including the waggle dance and the sensitivity of the antenna to the movement of the air by the wings and the vibration of the comb with their feet. Oh the little details that make me love the bees more and appreciate your magazine!

Thank you so much

Dedicated reader
Thea Vierling
Kenwood, CA

Watch the application video

Scan Me!

FORMIC PRO

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

Mite Away® Quick Strips

CERTIFIED INPUT FOR ORGANICS

SUMMER TREATMENT

RESIDUE FREE: Treat during the Honey Flow. Both Formic Pro™ and Mite Away Quick Strips® leave no residues in the wax or honey.

NATURAL: Formic Pro™ and Mite Away Quick Strips® are organically certified and are made from all natural RAW materials.

FOR HONEY: Maximize healthy colony populations by treating with Formic Pro™ or Mite Away Quick Strips® 4 to 6 weeks before main honey flows. Have extra supers on to give bees a place to move up and expand.

TEMPERATURE: Between 50°F (10°C) and 85°F (29.5°C) on day of application. Maximum temperatures should not reach above 90°F (32°C). Bees need to be flying regularly during daytime highs, therefore it should not be raining during the first three days of treatment. Nighttime temperatures below 50°F (10°C) are acceptable.

VENTILATION: Full width of hive, minimum 1/2 inch high. If using bottom boards with limited entrances, set-back second box by 1/2 inch to give fresh air access. Screen bottom boards should be closed off or anticipate a decrease in efficacy due to Formic Acid being heavier than air. Upper entrances and Screen bottom boards are not seen as additional or sufficient ventilation sources.

TREATMENT OPTIONS

FORMIC PRO

14 DAY
2 STRIPS APPLIED ONCE

APPLY 2 STRIPS AT DAY+0 FOR 14 DAYS.

20 DAY
1 STRIP APPLIED TWICE

APPLY 1 STRIP AT DAY+0 FOR 10 DAYS. APPLY 2ND SINGLE STRIP ON DAY+10 FOR 10 DAYS.

MITE AWAY QUICK STRIPS

7 DAY
2 STRIPS APPLIED ONCE

APPLY 2 STRIPS AT DAY+0 FOR 7 DAYS.

21 DAY
1 STRIP APPLIED TWICE

APPLY 1ST STRIP AT DAY+0 FOR 7 DAYS. APPLY 2ND STRIP AT DAY+14 FOR 7 DAYS.

Reminder, this bulletin is not a substitute for following the complete application instructions described on the label. Always read and follow the label.

Healthy Bees. Healthy Planet.

Now available in the USA through your beekeeping supply company

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

New For The Beekeeper –

Bee Magical Jewelry

I hand-make little bumblebee wish bracelets and sell them to raise awareness for saving the bees! All my materials are recycled for environmental sustainability & 10% of profits goes to charity for the bees (NY BEE SANCTUARY). The envelope contains an information sheet I wrote on how to help and explaining the bees' critical situation, and a small baggie with pollinator-friendly wildflower seeds. People can order a bracelet on my website for $10.

My website is **beemagicaljewelry.com**

Ceracell 2.5 Gallon Top Feeder

This unique feeder is imported from New Zealand and is the newest feeder to hit the United States. There is a limited quantity that will be shipped into the United States so get your order in now before they are all sold. Easy to assemble.

You'll love how well this top feeder works and the quality of the build that Ceracell has put into this new top feeder!

Extra Heavy Duty with underside ribs for strength. Made from 100% virgin food grade plastic. This comes in the most popular medium size holding 2.5 Gallons. It is a product that stands out from everything else on the market, hence the special corner access system is patented, and we want it to stand out visually as well.

You can use it just with the corners open, with or without corner caps, or you can also add central access. If you want the bees also have access through the central chimney you will need to drill the size of holes you prefer. We recommend 1/2 inch. Some beekeepers like large holes, some smaller. The choice is yours. Again, you can choose whether or not to use a chimney cap to protect the bees from drowning in the syrup.

You will need a wooden rim to support the feeder. We supply these too.

Top feeders are great for feeding raw or dry white sugar in the early and midwinter. Feeding in this way, don't use a "chimney cap" and let the bees range across the feeder. If using dry white sugar, you may want to add a small damp sponge to the top feeder to give the bees some moisture to work the sugar.

In the late Winter/early Spring you may want to feed a heavy syrup (4.5 pounds of white sugar to one quart of water, heated to fully dissolve). This shouldn't stimulate the queen to lay and with it being in a top feeder she shouldn't sense too much the sugar coming in. When feeding in this way, use a chimney cap to restrict the bees and prevent them from getting out in the bulk of the liquid. This will minimize drowning. If you don't have a chimney cap, you can fill the feeder with pebbles, or twigs.

For more information and to purchase visit **https://blythewoodbeecompany.com.**

The Frame Vault was born out of the necessity to protect frames with drawn comb during extended storage.

The honey bee works extremely hard to draw wax comb out each year. Therefore, it is essential, after the honey is extracted or brood boxes removed, that the frames be protected from insects like the wax moth.

Most experienced beekeepers know that it does not take the wax moth long to destroy what the bees work so hard for. It is estimated that it takes 8lbs of honey to create 1lb of wax. Personally, I learned that I get a better return during a nectar flow when I add a super that already has drawn comb. The frame vault allows the beekeeper to store their frames with confidence, that their frames will be protected.

Other ways to protect comb:

- Use chemical crystals.
- Freeze the frames.
- Store the frames in garbage bags.

All these methods work to some degree but have drawbacks that can harm bees or require lots of space.

The Frame Vault system takes all these limitations into consideration.

It is highly recommended that the frames be frozen for at least 48 hours. After the frames are removed from the hive or the freezer, they are placed in a brood box or honey super in conjunction with The Frame Vault.

The Frame Vault consists of a set with a lid and a base. The base is made of wood, with ventilation slats cut into the bottom. The lid is also made of wood, rests on top of the boxes to create a seal from top to bottom. Both the base and the lid contain a very sturdy stainless-steel

MADE IN AMERICA BY US. BUILT TO LAST FOR YOU.

2017 PRICING
On all orders picked up at any of our 11 Branch Locations!

NOW OFFERING FREE SHIPPING on purchases of $100 or more

Since 1863 Dadant & Sons has produced quality beekeeping supplies. Manufactured in the U.S. at the Dadant Metal Plant, our line of American made extractors, tanks, and smokers are built to a quality matched by none. At Dadant, we believe that **"it pays to furnish good goods."**

Dadant

www.dadant.com

screen mesh. This allows for adequate ventilation while keeping the wax moth and other insects out.

One of the greatest attributes of the Frame Vault is that it needs no chemicals.

The Frame Vault can also be used when removing honey supers. After the bees have been cleaned off the frames, then the boxes can be stored by using the Frame Vault. This keeps the bees from re-entering the supers so robbing does not occur. We recommend one Frame Vault set per two hives.

To order your Frame Vault please visit our website **www.resterfarms.com/framevault**.

If you have any questions please email me at **ken@resterfarms.com**

Pierce Beekeeping Equipment, a manufacturer of innovative tools for the international beekeeping community, has expanded its manufacturing operation with a second location in southern CA. The company, now under new ownership, has increased production of the popular Speed King Electric Uncapping Knife which is sold through distribution to beekeepers all over the world.

Pierce Beekeeping Equipment, established in 1947, is now owned by Anura & Nancy Welikala, who purchased a Speed King Uncapping Knife for their home hive and loved the product so much they decided to purchase the company. Anura Welikala spent 35 years working in the plastic manufacturing business, primarily in medical device manufacturing, and understands the importance of quality products that are built to last.

Pierce has implemented new equipment, streamlined processes, and hired additional employees in order to increase capacity and get knives into the hands of global customers much faster. Despite all the production improvements the knife's core components are still produced by hand and the thermostat, in particular, is built to last much longer than cheaper, mass produced thermostats.

Aside from heated uncapping knives, Pierce also manufactures heated scrapers, steam knives, queen tools, and other hive tools for beekeeping. New products are currently under development and Pierce invites beekeepers to provide feedback on products they would like developed. Contact Pierce Beekeeping Equipment at **info@pierce-beekeeping.com** or visit us **www.PierceBeekeeping.com**

Betterbee®

Beekeepers Serving Beekeepers®

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

Varroa Varroa Varroa!

Life sized mites

Enlarged 5x

The Varroa mite is responsible for spreading a number of viruses to your bees.

Relying on visible inspection alone is not sufficient for keeping mite levels down. Conduct regular testing to ensure the health of your colony.

Mite Monitoring

Successful beekeeping requires you to monitor your mite levels, and treat when necessary.

Screened Bottom Board with Tray

The screened bottom board allows you to conduct a mite count, without disrupting your bees.

To use: Coat the plastic tray with vegetable oil, insert tray and allow for 24 hours to pass by. Then count the number of mites on the tray to determine if mite treatment is needed.

Varroa Easy Check

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

To use: 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.

Varroa Testing Kit

This varroa sugar kit utilizes the sugar roll method and includes everything you need to check for varroa mites, except the bees.

The sugar shake method leaves your bees unharmed .

Check out our catalog for instructions!

Treatment

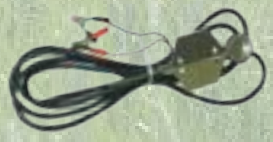
Apivar
10 Pack: $36.95
50 Pack: $142.95

Apiguard
10 Pack: $39.95
6.6 lb Pail: $110.15

Formic Pro
2 Dose: $15.09
10 Dose: $57.37
25 Dose: $119.22

HopGuard II
$47.02

HopGuard® II



Varrox Oxalic Acid Vaporizer
$164.75

Betterbee offers a wide range of mite treatments, including Oxalic Acid (not shown). Call to determine what the best is for you!

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

INNER COVER

Every third bite. How many times have you heard that in the last 10 years? Millions, I'll bet. And, generally, there's more truth than not in that statement about the role honey bees play in our daily diet. But let's dig down a little bit and ask the next question. Every third bite we eat may be from honey bee pollinated food, but, and here's the real question, where does that food actually come from?

Well, 55% of all the fruit we eat on a daily basis comes from someplace other than the farmer down the road. And 35% of the vegetables we eat come from someplace else too. If you look at just those crops that depend on bees, it goes like this. Fully 85% of all the Guacamole at Chipotle's comes here on a boat or plane, 82% of the Kiwis we eat come from New Zealand, 78% of the blackberries come on a plane from somewhere else, 74% of the cukes and 65% of all the squash we dine on are not from here, while 60% of all the green peppers (and red, white, yellow and most of the hot peppers) come from other places, and 57% of the blueberries, not the wild blueberries from Maine, but the domestic kind are not locally produced either. And all of these need honey bees for pollination so the growers get fruit set.

We worry a lot about having enough bees to pollinate crops like almonds and all the rest, but over half of the fruit we eat has to be pollinated by bees in another country. What country? Glad you asked. We get 46% of what we import from Mexico (that's about a quarter of the fruit we eat daily), 15% from Chili, 9% from Guatemala, and the remaining 30% from all over the rest of world. Lots of beekeepers in all of these places have lots of bees doing all of that work. Not bee required, but the crops that would cause me the most distress if they quit coming here would be garlic – 75%, and tomatoes – 57%, and of course limes at 99.9%. Imagine a pizza and gin and tonic without those three ingredients.

Why do we import so much of what we eat rather than grow it here? Well, some things we would be hard pressed to grow here. Over 95% of the bananas, mangoes, pineapples, papayas, and asparagus, are imported, though asparagus wouldn't be all that hard to grow almost anywhere here, but the labor to grow and harvest is really expensive. And labor is a big reason lots of fruit and veggies aren't grown here. It's cheaper somewhere else. But the rules and regulations in those countries regarding pesticides that can be used are less stringent, too. We're a lot tighter on some of those than other countries and growers can take advantage of that, too. Studies have shown, not surprisingly, that foreign fruit has more pesticide residue than home-grown, but not much. Only 9.4% of fruit has over the limit poisons on them, while 2.2% of the US crops were guilty. For vegetables, it was 9.7% compared to 3.8% US grown. Not much from either, but a number worth remembering. In fact, the number of US producers who have moved some part of their operations to countries with cheaper labor and less strict pesticide regs grows every season. That makes sense, kind of.

Another reason is that simply, we can afford to eat imported food so there is a demand, aided by the diets of immigrants who have brought their foods with them creating more demand. Freshness is a factor – consider New Zealand apples are picked during our spring, while what we have left over from last year's harvest has been in storage for months. With this it would seem that perhaps travel time would lead to nutritional or freshness degradation, but improved shipping, including lots of next day air travel, has negated most of those issues. But the other side of that is a bigger carbon footprint, especially for air travel, thus higher costs. But then, we can afford those costs, can't we.

All in all, USDA predicts that by the next decade, fresh produce imports will rise 45%, meaning three quarters of fruit and half of our vegetables will come from off shore. Already, 80% of the fish we eat swim here from someplace else.

Sounds a lot like honey, doesn't it.

•

Last month I briefly hinted at the gold rush mentality going on in New Zealand because of Manuka honey. So I've done some research into why it is what people claim it to be – that is, extremely anti-bacterial, and overall generally healthy for you.

But let's start at the beginning.

The manuka tree, it is actually a small tree, growing 15' to 20' tall, is a pioneer plant that moves into an area after an existing forest has been removed. Think Fireweed in Alaska. This happened in New Zealand when the first European settlers moved in and essentially denuded much of islands by burning and tree removal. After only a short time manuka moved in and colonized the areas that were harvested. But because the settlers brought in sheep, cattle and crops, the forests didn't return in earnest and manuka continued to thrive in the now open fields. New Zealand still relies on timber as an export crop, being third behind dairy and meat exports. Forests, mostly pine and fir, cover only about 31 percent of the land. And, although much replanting has been done to boost export crops, manuka is still a predom-

Fruit
And
Honey.

inant tree in clearings.

Manuka bloom begins in the north of the North Island in early November, and continues until March as the season moves south (here, seasons move north, there they move south). Beekeeping has become more migratory as hives are moved to follow this bloom. Like all varietal honey production, beekeepers generally wait until the bloom has started before adding or replacing honey supers, and remove them just before bloom ends, ensuring the purest product possible. They are fortunate in that in most places there are few competing crops during bloom so what they harvest is often nearly pure.

Because of new regulations, manuka honey is traceable from super to bottle. Samples from each beeyard are sent to one of the two main independent laboratories in New Zealand, and they will test the honey for dietary Methylglyoxal. Dietary Methylglyoxal, abbreviated as MG or MGO, is a naturally occurring organic compound found in high concentrations in Manuka honey. Test results are given as mg/kg, and the concentration of MG directly correlates to the health and wellness benefits of Manuka honey. Typical tests come back anywhere from 100–250 mg/kg at the time of harvest, and then, and this was amazing to me, this concentration changes during the one to two year storage, or "maturation" as the honey "grows" in activity. For a detailed explanation of these tests, and the history of how they developed, read "DHA, MG, and manuka honey activity" by Megan Grainger, Ph.D.

Because of the value of this honey on the world market, the Ministry for Primary Industries (MPI) (think of it as our USDA) got involved and brought some order to the chaos that was happening. From their web page:

In December 2017, the Ministry for Primary Industries (MPI) finalised a robust and sophisticated scientific definition that can be used to authenticate whether or not a particular honey is New Zealand mānuka honey. We've also introduced requirements to improve how bee products are traced through the supply chain to make sure New Zealand bee products comply with importing country requirements.

Why the rules are needed

The science definition for mānuka honey is essential to maintain New Zealand's premium position in overseas markets. It will also help the continued growth of our export honey industry. It's important that overseas regulators have confidence in the assurances we give them about New Zealand mānuka honey and that consumers in export countries are confident they're getting genuine mānuka honey. If not, our access to markets could be put at risk or we may lose the premium prices our bee products command overseas.

Tests to authenticate mānuka honey for export must be tested by an MPI-recognised laboratory to make sure it meets the new mānuka honey definition. That mānuka honey definition is made up of a combination of 5 attributes (4 chemicals from nectar and 1 DNA marker from mānuka pollen). This allows industry to separate mānuka honey from other honey types and identify it as either monofloral or multifloral mānuka honey.

In response to industry's feedback we've increased the required level of one of the chemicals (2'- methoxyacetophenone) that has only been found in mānuka plants to date. This makes it harder for anyone to attempt blending different types of honey with mānuka honey to meet the definition.

Only certain MPI-recognised laboratories are allowed to test mānuka honey and not all laboratories can do both types of test. When honey is tested to the mānuka honey definition, the laboratory will provide the results of the test. However, it is up to the operator to interpret these results to determine if the specified levels of the chemicals and DNA are present to allow them to label the honey as monofloral or multifloral mānuka.

There are extremely strict requirements for exporting honey labeled manuka, and even for selling it at home. And continuous testing is ongoing to prevent fraud or contaminated products from reaching the market.

Recordkeeping requirements for bee products

To improve traceability of bee products through the supply chain, we've introduced new recordkeeping requirements. If the only thing you do is beekeeping, you must be listed with MPI, keep information about your apiary sites including the location, the number of supers (hive boxes) from that location, the volumes of bee products harvested, provide an identification number for every honey box and provide documentation (harvest declarations) for every delivery of bee products presented for extraction.

If you are an operator (extractor, processor, or packer), you must provide documentation every time you transfer a consignment of bee products to another operator or an exporter.

MPI's work to create a science definition

MPI's definition is the result of a significant three-year scientific programme, which developed the criteria to identify mānuka honey from New Zealand. The programme involved:

- *working with local and international experts*
- *collecting and testing over 800 honey samples, representing over 20 different New Zealand honey types from 7 production years*
- *collecting and testing over 700 plants from 2 flowering seasons*
- *analysing the data using a range of advanced statistical models. We had our analysis independently reviewed by 3 international experts*
- *identifying markers in the mānuka plant and honey that help distinguish mānuka honey from other honey types*
- *using test methods that can consistently and accurately test for markers*
- *determining reliable identification criteria for monofloral or multifloral mānuka honey.*

Of course Australia is in on the game now, so it will be interesting to see if they follow similar methods to determine the purity of their manuka honey.

Time will tell.

•

A cold, wet Spring almost everywhere means a couple of things. Honey crops will be bunched instead of spread out so get supers on yesterday, so there's room for all your bees can collect. The other issue is crops needing pollination will bloom closer to each other so you'll be scrambling if that's what you do. And, like me, your garden probably went in late. Early tomatoes will do okay, but late squash will have to hurry. And those late tomatoes, they'll only get to be three pounds, instead of that better four.

Summer time. Keep your smoker lit, your hive tool handy and your veil tight. There's bees out there.

A Closer Look

Basic Honey Bee Biology

NEW!

X219

$15.00

www.beeculture.com

274 pages, color

Clarence H. Collison

It's Summers Time –

California and North Carolina, and A Funny Chicken Story

The month of April was a busy month for us. But it was great. Kim and I along with Jean, our advertising coordinator, made a trip to California for the Olivarez Honey Bee Hobby Day. It was great. This is the second year in a row that Ray and Tammy Olivarez have invited us out there to be part of their special day.

Ray spent a big chunk of Friday with us showing us around their place, visiting the beeyard where they were shaking packages to send to our part of Ohio. This was my first time to actually see the whole process of shaking packages and getting them ready to load on the truck. It was fantastic. Ray has an amazing crew working for him.

On that Friday we first went to the beeyard and watched them shake packages. We marked packages that were coming to Jim Tew here in Ohio and then went with Jim the following Monday to pick them up at Queen Right Colonies. These guys moved fast - shaking bees from the hives into a metal screened box, then over to the funnel and scale to weigh out exactly 3.3 pounds, then into the plastic packages that already have a queen loaded into them, sugar syrup can loaded in and they're ready to go on the truck. They are marked with a black marker on the top of the sugar syrup either with an I for Italian or a C for Carniolan and now they have S for their new Saskatraz honey bee.

The metal screen box is carried from hive to hive until it's almost full and then taken over to the scale and funnel.

Kim chatting with Ray Olivarez, just before we headed to the beeyard.

The beeyard setting was beautiful, the weather was great. It was the perfect day.

Funnel and scale.

After the package shaking we headed back to their main property and got to see them grafting queens, pulling queens and getting them ready to go into more packages.

Grafting queens as fast as she can.

She's counting and checking queen cells before they go into the incubator.

The next day, Saturday, about 1,500 or more packages were picked up. Some folks were picking up just one or two for themselves, others taking a couple hundred back to their area and dispersing them to others. Kim, Randy Oliver and Larry Connor were all a part of the day. Kim answered questions that new beekeepers had. This is the best kind of format – Kim in a room with new people and just letting them ask what they want. Randy did live hive demos and Larry talked about biology.

It's almost a carnival atmosphere – food vendors, music, games and activities for the kids, vendors selling books and bee equipment. If you're in northern California you should think about going next year. Ray and Tammy are wonderful hosts and they have an amazing business going out there.

Ray will be speaking at our October event here in Ohio. He'll be telling us all about how they got where they are.

Our next April trip was to Asheville, NC for the Mother Earth News Fair. I love this trip. It's easy, everything is close to the airport and the fair is great. There are so many different kinds of speakers, vendors, exhibits – it's fantastic.

On Saturday Kim gave his 'All About Drones' talk and then on Sunday he and Shane Gebauer from Brushy Mountain did a live hive demo in one of the outdoor tents. They've done this a few times and it works really well. Shane is in a smaller tent opening and working a live hive. Kim is on the outside answering questions and showing frames of bees to the folks in the audience. They've got it down and work very well together. The next Mother Earth we'll be going to will be in September at Seven Springs Resort in Pennsylvania.

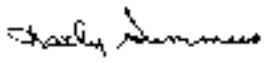
Shane and Kim getting ready at Mother Earth News Fair.

And now for my chicken update. Kim often puts the chickens to bed at night (closing the door), but sometimes if I'm coming home from a meeting or dinner with friends I'll take care of it before I come inside.

We've been holding at 20 chickens for quite some time now, all doing well. So a week or so ago I came home one night and went to close the door. We always count to see if everyone is in. I counted 19. Okay count again – 19. So I looked out in the pen, none out there, looked around the yard a bit – it wasn't completely dark but I had my flashlight. Still 19. Oh well, we've lost a chicken, it happens. The next night I was out again, it was a busy week. Same routine. This time I counted 21 chickens. Okay, it's been a long week and I'm tired. Let me try this again. Still 21. So I go in the house and get Kim. "Please come out here and count the chickens." He counts 21. So we close the door and go in the house.

Still not sure what exactly happened, but apparently one of our neighbor's chickens came over for a visit. And maybe that's what happened in reverse the other night, one of ours went over there for a visit. But now we're back to our own 20 chickens, doing well.

Summer like weather has finally arrived in Northeast Ohio. I hope it has for you as well. Enjoy the season.



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!

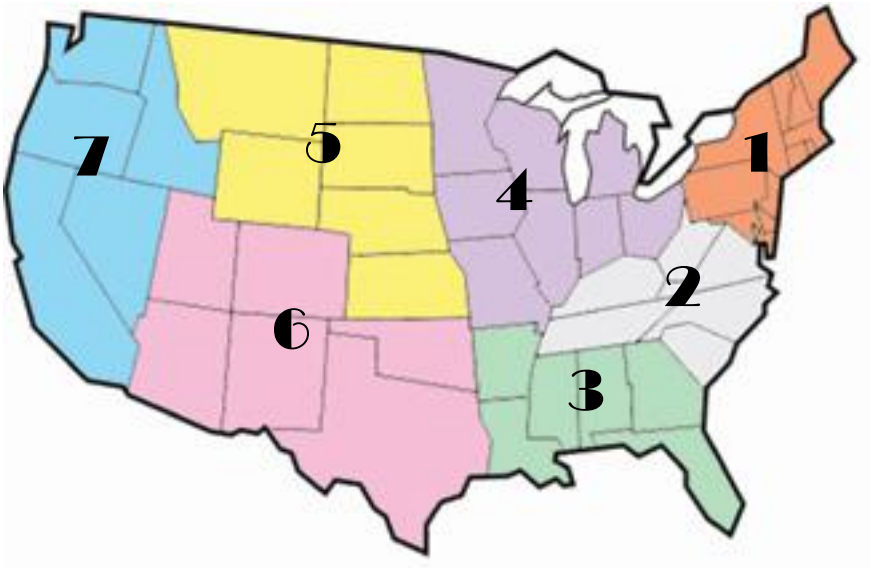
EXCELLENT BEE ACCEPTANCE!

Call Acorn Bee Today!
877-255-6078

VISA MasterCard

PROUDLY Made in USA

JUNE – REGIONAL HONEY PRICE REPORT



Winter & Spring Conditions

We checked in with our reporters this month to determine how good, or how bad their Spring weather had been, and what effects this has had on their bees and their beekeeping work, plus we asked for overall combined Winter/Spring colony losses. The responses were pretty uniform by region, but as you can imagine, quite different between regions, except it was cold and wet almost everywhere.

Region 1. Across the board spring was too cold, with far too much rain, both in amount and number of times it rained. As a result, bees are way, to somewhat behind where they should be, and bee work is the same. Average Winter/Spring loss was 40%.

Region 2. Cold and wet. Enough said. This means bees are somewhat to way behind schedule, but most of the bee work is pretty close to where it should be, all things considered. Losses averaged 27%.

Region 3. Too cold, too much to just enough rain though means the bees are somewhat behind, with some way behind, and bee work somewhat behind to about where it should be, which is good news. Losses were the lowest for all regions at 21%.

Region 4. It was cold in region 4, with rain just enough bordering on too much for most of the region. Bees are about where they should be but a bit behind, and beework, too is a bit behind but close to where beekeepers think they should be. Losses averaged 29% across the region.

Region 5. It was cold in region 5, but moisture bordered on just enough to not quite enough for most. This got the bees to just about where they should be, but some are lagging, and beework is actually ahead of schedule for many this season. Average losses were 42%.

Region 6. Dry, more dry and a little bit cold this spring. And not nearly enough rain for anybody. This means the bees are somewhat behind waiting for nature to catch up, and beework is the same. Losses were 31%.

Region 7. It was cold in region 7, too, but they had, overall enough rain, but it came in buckets when it did causing problems in much of the region. The bees are about where they should be, but some are behind, and beework is too. Average losses here were the highest of all regions at 46%.

Looking at average losses and the regional map, these losses correlate quite well with average Winter and Spring stresses. Cold in the north where losses are highest and warm in the south where the averages are lower. A conclusion one scientist we talked to came up with was that pretty much all colonies suffer the same stresses from *Varroa* and their viruses, which produce a somewhat predictable baseline of losses in the range of 20+%, but it's the environment that causes the differences above that. Perhaps that's a pretty good assessment.

REPORTING REGIONS								SUMMARY			History	
	1	2	3	4	5	6	7				Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS								**Range**	**Avg.**	**$/lb**		
55 Gal. Drum, Light	2.32	2.18	2.32	2.46	2.25	2.19	3.00	1.74-3.00	2.28	2.28	2.36	2.25
55 Gal. Drum, Ambr	2.47	2.14	2.20	2.36	2.47	2.10	3.25	1.35-4.00	2.26	2.26	2.22	2.17
60# Light (retail)	210.44	185.64	191.25	199.35	210.44	185.24	210.44	155.71-280.00	203.03	3.38	201.79	202.99
60# Amber (retail)	201.88	180.20	187.50	196.35	201.88	179.68	230.00	143.71-260.00	201.90	3.36	204.60	196.55
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	90.77	75.28	90.80	65.75	57.84	84.00	90.77	57.60-139.40	83.04	6.92	80.90	88.81
1# 24/case	137.44	107.26	130.76	115.74	127.16	124.88	128.40	86.40-211.20	126.08	5.25	127.06	126.09
2# 12/case	123.13	96.47	113.78	103.88	97.44	98.40	114.00	78.00-192.00	111.26	4.64	107.75	114.81
12.oz. Plas. 24/cs	114.66	87.52	93.50	85.00	74.40	106.40	97.20	66.00-192.00	100.33	5.57	96.27	100.91
5# 6/case	133.02	108.61	186.00	114.43	102.30	115.50	133.02	71.50-210.00	125.30	4.18	125.82	127.63
Quarts 12/case	163.09	134.28	131.61	157.64	155.32	130.18	144.00	109.20-250.00	146.58	4.07	143.93	146.43
Pints 12/case	105.79	88.17	74.50	107.33	111.00	75.98	84.00	65.00-168.00	95.08	5.28	89.19	92.42
RETAIL SHELF PRICES												
1/2#	5.39	4.19	4.70	4.05	3.98	3.93	7.00	2.86-9.00	4.85	9.70	4.60	4.77
12 oz. Plastic	6.55	4.97	5.04	5.34	4.76	5.85	6.40	2.65-12.00	5.77	7.69	5.61	5.99
1# Glass/Plastic	8.19	6.94	7.24	6.30	6.54	6.58	9.00	4.00-14.00	7.39	7.39	7.10	7.43
2# Glass/Plastic	12.79	10.36	12.17	10.88	11.64	9.75	15.33	6.00-21.00	12.09	6.04	12.05	12.04
Pint	11.64	8.93	9.00	13.14	10.00	9.25	10.30	6.00-20.00	10.29	6.86	9.95	9.78
Quart	18.52	15.97	16.17	14.79	15.98	15.96	20.47	8.00-32.00	17.05	5.68	16.58	16.61
5# Glass/Plastic	27.87	24.50	33.75	22.43	22.41	25.98	35.00	15.00-43.25	26.61	5.32	26.61	26.40
1# Cream	11.19	8.25	11.25	7.25	9.99	5.50	10.00	5.50-20.00	9.64	9.64	8.71	9.43
1# Cut Comb	13.16	9.43	9.00	9.94	11.00	6.50	14.50	6.00-24.00	11.33	11.33	10.64	11.34
Ross Round	9.16	6.76	9.16	9.00	9.16	10.50	12.49	6.00-12.49	9.08	12.10	8.75	9.02
Wholesale Wax (Lt)	7.78	5.11	5.25	5.90	6.00	4.69	10.83	3.00-15.00	6.56	-	6.58	6.02
Wholesale Wax (Dk)	6.35	4.72	4.18	5.73	6.35	3.17	6.75	2.00-12.00	5.69	-	5.62	5.01
Pollination Fee/Col.	90.58	80.00	63.33	77.50	80.00	90.00	65.00	45.00-150.00	83.65	-	87.50	93.48

Bee Culture

Magazine Of American Beekeeping

2½ 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.

Bullying – If It's Different Is It Wrong?

Albert **Chubak**

Bullying is not only exhibited by young people, it may be the office jerk who you wish would just quit. Bullying is a form of control where the instigator wants to usurp power or force an ideology on another person. Society as a whole sees differences as not necessarily bad, evil, or corrupt - just different. What is good for one is not always good for all. One thought, method, practice, an application is rarely universal as many situations can exist that need variation. In beekeeping, many think one system or practice or belief should be universal and should not be questioned. Many beliefs are shared in books written by those in the bee world that claim to be the "way it is." However, beekeeping is a regional thing and adaptation to the environment, local conditions, personal limitations, and needs all play a part in what method, hive, system, or application is, will, or could be used. Regularly there are posts where the "all knowing" seasoned beekeeper will share his "word" on what should be followed in relation to a hive type. Many times, this insight is not wanted nor sought but comes and can be critical and demeaning. Bullying in any form is ignorant and short-sighted.

Historical development and where we are

There was a time beyond our days when the craft of beekeeping was excitingly new, and almost anything was accepted, tried, and even patented. Every thought, idea, method, and structure was detailed and submitted for a patent then labeled and accredited as a "patented beehive." As the beekeeping ideas were tried, slowly some faded away, and are now lost. The victor in the battle of the 19th-century beehives was Lorenzo Langstroth's hive. It was the simplest design with the greatest commercial potential. This hive though did not meet every beekeeping need then or now, so other systems and styles have evolved.

Joining an extended partially intolerant family – a family of beekeepers

Today there are about 800 beekeeping clubs nationally in the US. According to the USDA in October/December 2017 there were 3,032,060 commercial honey bee colonies in the United States (http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1943). Hobbyists increase that total significantly. An estimate on the number of beekeepers in the USA is quite elusive but is believed to be between a half and two million.

Many beekeepers are private in how they manage their colonies, yet others are quite outspoken. The adage, "ask 10 beekeepers a question, you'll get 10 answers," is quite realistic. With the advent of social media, many have sought their beekeeping enlightenment via venues like YouTube and Facebook. Those joining the ranks of "beekeeper" initially view others as perhaps their new family. Comradery is expected, but for those who choose a variant system/hive, a door is opened that leads the beekeeper initially into defense mode. This defense is a result of ostracization, ridicule, and simply bullying. Instead of a welcoming hand or word of friendship, many are avoided as their choice of a hive is not the standard Langstroth hive, so clearly, they must be on an opposing beekeeping team!

The world of beekeeping is not all Langstroth's world

Variant hives have always existed, with the most common 21st-century styles/methods being:

- Warre hive,
- Top-bar or Kenyan hive,
- Horizontal or Long-box hive,
- Flow Hive,
- Mini Urban Beehive,
- Slovenian hive,
- Barrel hive, bullet and others

Each hive system serves a specific need due to regional issues, or adaptation to a specific environment, local conditions, personal limitations, honey production, bee health, growth cycles, emotional, medical, diet, age, millennial status, ease or simplicity, and of course beauty. Those with variant hives seeking beekeeping answers may be bombarded with responses typical of the Langstroth method. Those loyal to this 19th century adaptation in beekeeping (Langstroth) may display almost religious zeal in defending their "hive" and opposing others as "second rate" or "novelties." Another saying, "If you want to be a beekeeper, you need to do as the big boys do." The beekeeper's perceptional view window is stuck on one setting (hive), even though they agree many hives exist. It is narrow-minded to think one hive style can serve every need. Other needs exist besides HONEY.

When the "Flow" hive made its initial debut on social media, many traditional beekeepers were vehemently opposed to it while new beekeepers were mesmerized by it. Some of the hatred rose due to the horrendous amount of "hey look at this new hive" posting. Many traditionalists tried to mansplain the reasons why it was bad, evil, foolish without ever trying it. Not everything needs to be tried to expose faults. Experience can replace some testing but testing is the best route. Many reasons have been touted in opposition to this new hive system, but many have now successfully used it. Is it a perfect system? The answer is to be decided by the one using it. Years ago, we had rotary telephones and we loved them – longer cord the

better. Today we have minicomputer style cell phones, and we love them despite their costs.

Basing a belief on a myth is like believing in a fairytale

There are myths in beekeeping that are actually false but are promoted and taught by many.

- **A colony needs 80lbs of honey to survive a Winter** (Smaller colonies require less stores. Carniolan bees go through Winter with smaller colonies and can survive with less. Italian bees build up to large colonies that consume a great deal of resources even in Winter).
- **You can't start a colony without a queen** (As long as there are nurse bees with eggs laid by a mated queen and available resources of pollen and honey, the colony can create a queen).
- **All honey bees are aggressive** (Defense bees are protective; nurse bees are non-aggressive).
- **Plastic foundation is the only way to have perfect frames** (Smaller frames with starter strips of thin surplus create perfect honeycomb).
- **Only a double deep or equivalent hive can survive the Winter** (Small colonies have survived the Winter in nature for millions of years. Methods and hives exist that prove this false).
- **A swarm in May is worth a load of hay, a swarm in June is worth a silver spoon, a swarm in July isn't worth a fly** (Swarms can always be added to an existing colony. Double queened colonies also generate faster larger bee populations. Mini colonies can be started as late as October that survive the Winter).
- **The size of the hive is equal to how much honey can be produced** (Honey production is related to available forage and health of the colony. A smaller colony/hive can out-produce a larger colony/hive based on location, health, and age of queen).
- **Only a three-lb package or a five frame Nuc can build a colony that can survive the Winter** (Colonies started with as little as two 6"x6" frames of open brood with nurse bees in June cannot only create a locally mated queen but also survive Winter in any North American climate).
- **Bees prefer a vertical hive compared to a horizontal hive** (Many methods/hives exist globally, showing bees adapt to their chosen hive).
- **Drawn wax takes lots of resources for a colony to produce** (Wax is produced quickly when nectar is abundant. Inducing wax production can be facilitated by feeding both carbs and protein).
- **One hive style is perfect for every application** (Many needs exist for having honey bees ranging from medical apitherapy to apartment dwellers, to pollination gardens and seniors or children and those with handicaps. One size hive does not fit all needed applications).
- **The best hive is the Langstroth hive**. (There are many hives and each has pros and cons. The Langstroth hive is the best commercial hive as it is adapted to facilitate honey production and pollination. It is not, however, a great hive to learn on. It is heavy, requires extraction, utilizes plastic foundation, can be overwhelming to a new colony and beekeeper).

Learning how to be kind to one another, an art social media decimated

The true teacher understands a student may learn in many ways, one of them is in failure. Failure is a powerful teaching experience. It is also vital that the teacher first learns about the item in question. Speaking generally about beekeeping is a broad topic, whereas speaking about a specific method requires an understanding of that method. To teach requires kindness and tact like the powerful saying, "If you don't have anything good to say, don't say nothing at all."

According to Karanveer Pannu, the number one cause of bullying is ignorance. **www.theodysseyonline.com/detrimental-consequence-ignorance-lack-education**

Other suggested guidelines to prevent beekeeping bullying online or otherwise:

- Do not speak down to the person or use derogatory comments.
- If you do not have specific understanding related to the item discussed, say nothing at all.
- First, seek to understand the needs of the individual.
- Suggest where information can be obtained, if known.
- Refrain from mansplaining or trying to redirect to a personal agenda.
- Understand many views can be right, but the missing key may be what "they" want, not you.
- You may not know everything about beekeeping, even though you are a beekeeper, that is okay.
- Sometimes helping may be just listening.
- Understand the question before you respond.
- Keep your personal feelings to yourself.
- Avoid manipulation, as it is the act of intentionally trying to redirect to your way of thinking.
- If related to the Internet, know many may see your comments besides those in the discussion.

A recent discussion on a Facebook site was initiated by a new beekeeper wanting access to bees. Instead of specific help solving her issue, discourses followed relating to the "poor" choice of beekeeping equipment. In the end, a personal response was sent via private message "Looks like I am now hated by my new friends." As referenced earlier, do we "eat our own" or do we nurture them to succeed despite what we think is good for them? BC

Albert Chubak owns and runs Eco Bee Box in West Valley City, UT.

EDITORIAL

Bee Culture's
Pollinator Coloring Book

$15.00

X218 – Visit
www.beeculture.com

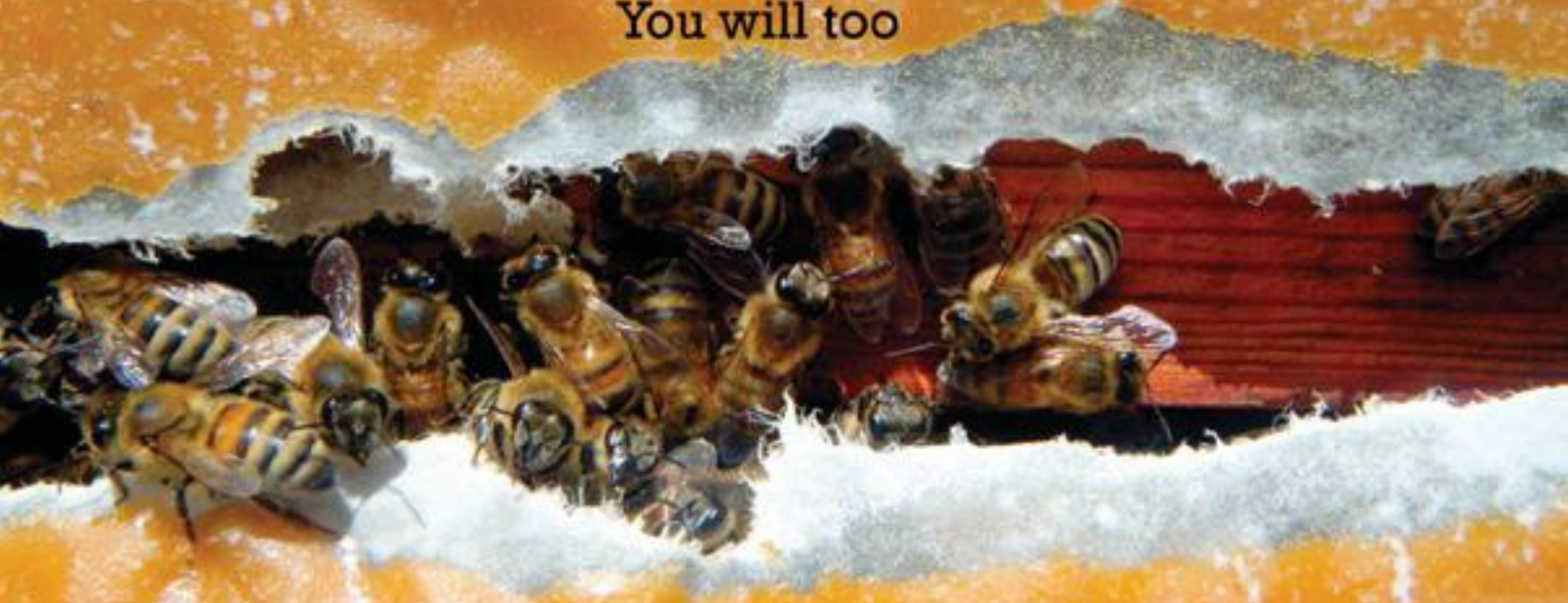
24 8½" x 11" pages to color and design. Birds, bats, bees, butterflies, flowers, dragonflies and more. Heavy Duty, non-bleed paper.

Bee Culture
The Magazine Of American Beekeeping

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

Synthetic Pollination & Invasive Species

Will **Caverly**

Breathless reports tell that us flights of artificial pollinators will arrive any minute. A scientist at Japan's National Institute of Advanced Industrial Science and Technology created a miniature drone with a patch of electrostatically-charged clingy hair to catch pollen[1]. In the USA, Harvard scientists from the Wyss Institute work hard on a similar RoboBee[2]. Their version remains tethered. Researchers hope that further development will let them unleash their creation from a power-providing umbilical. Scientists from both research groups grant that biological pollinators still possess greater efficiency in agricultural pollination services. But they're hopeful. They believe their creations can save agriculture by replacing species in decline.

Others warn of the dangers of these synthetic pollinators. Greenpeace's cunning "NEW BEES" video[3] looks like a pharmaceutical advertisement. In it, a field's pollination needs are satisfied by autonomous pollinators linked to a deployment station with a pulsing green light. The New Bees destroy enemy insects – an Asian Giant Hornet plays the villain – with targeted applications of pesticides. Two children frolic in the field, safe from harm. The Greenpeace video ends with an alarming question: *"Should we create a new world or save our own?"*

Confronted by these two futures, beekeepers cower behind their veils.

The debate[4] over whether or not to deploy synthetic pollinators is young. But it proceeds predictably. Pieces on synthetic pollination seem to focus solely on the engineering marvels of new devices (thus avoiding green-tinted controversy) or the audacity to create something that could replace ecosystem services (ignoring the well-meaning of engineers). Colony collapse disorder is trotted out. Einstein usually lurks somewhere in the background, threatening to pelt everyone with warnings about the end of civilization. Soon, the prospect of human control over the agricultural services and our ecosystem becomes an attractive alternative to extinction. In many ways, the debate is already over. WalMart recently secured patents for autonomous pollinators, as well as drones that track down plant pests and drones that monitor crop health[5].

Tree Of Life

But absolute control over all pollination introduces interesting questions about the role honey bees and their native cousins play in the world's ecosystems.

POLLEN PROBLEMS

Honey bees, with their two mile forage range, represent a vital pollinator in their habitat, whether as an introduced species, such as in North and South America, or a native species, as in Eurasia and Africa. According to recent research, honey bees act as a foundational pollinator (Hung, Kingston, et al. 2018)[6]. In some areas, research found that honey bees represent nearly all pollination.

But as a beekeeper, it didn't take me long to recognize my bees had preferences. They pollinated what they wanted, when they wanted. Intentional plantings on our Pennsylvania homestead went unnoticed. The bees only found the borage late in the season. I usually don't see the honey bees on our tomatoes.

On the other hand, our burning bush looked like a bacchanalia in the Spring, with some kind of bee hanging on every one of its tiny green blooms. As some may know, the introduced burning bush species (*Euonymus alatus*) represents a threat to local ecosystems. Plenty of people later enjoy the fiery Fall foliage, but it spreads rapidly through its copious berries, which are also poisonous to humans. It displaces native plants. But the bees love the nectar. Other invasives I have seen my bees visiting include: multiflora rose (*Rosa multiflora*), Canadian thistle (*Cirsium arvense*), Bermuda grass (*Cynodon dactylon*), and my

[1]Checheka, Yu, Tange, Miyako. " Materially Engineered Artificial Pollinators". Chem. Volume 2, Issue 2. February 9, 2017. https://www.sciencedirect.com/science/article/pii/S2451929417300323

[2]Wood, Nagpal, Wei. "The Robobee Project is Building Flying Robots the Size of Insects". Scientific American, March 2013. https://www.scientificamerican.com/article/robobee-project-building-flying-robots-insect-size

[3]Greenpeace. "New Bees". 2014. https://vimeo.com/93239025

[4]See Ponti. "Rise of the Robot Bees: Tiny Drones Turned into Artificial Pollinators." NPR.org. March 3, 2017 https://www.npr.org/sections/thesalt/2017/03/03/517785082/rise-of-the-robot-bees-tiny-drones-turned-into-artificial-pollinators and Spector. "Tiny Flying Robots are Being Built to Pollinate Crops Instead of Real Bees". Business Insider. July 7, 2014 http://www.businessinsider.com/harvard-robobees-closer-to-pollinating-crops-2014-6

[5]Burton, Bonnie. "Walmart wants to make autonomous robotic bees a reality." CNET.com. March 27, 2018. https://www.cnet.com/news/walmart-to-make-autonomous-robot-bees-pollen-drones/#ftag=COS-04-10aaa1a

[6]Hung, Kingston, Albrecht, Holway, Kohn. "The worldwide importance of honey bees as pollinators in natural habitats." Proceedings of the Royal Society B, Biological Sciences. January 10, 2018. http://rspb.royalsocietypublishing.org/content/285/1870/20172140

vote for tastiest invasive, Japanese wineberry (*Rubus phoenicolasius*).

My bees travel long distances to perpetuate species that harm landscapes, displace natives, and create wildlife habitat for other invasive species. The last is especially a problem here in Southeastern Pennsylvania, where the invasive tree of heaven (*Ailanthus altissima*) plays host to a frightening species of invasive insect, the spotted lanternfly (*Lycorma delicatula*). While I haven't observed it firsthand, I have read beekeepers online complaining about piney-smelling honey from the tree of heaven. I will be examining their blooms this Spring to see if my bees are attentive to them.

If a flower is in abundance, it tastes swell, and the weather is right, honey bees will be there by the thousands. Honey bees find what nectar they like and exploit it, irrespective of its origins.

SCIENCE FICTION

In a dystopian future, our European honey bees may not exist in North America. Any number of threats persist: *Varroa* mites, Lake Sinai virus, Deformed Wing virus, small hive beetle, wax moths, skunks, possums, raccoons, bears, yellow jackets, and teenagers. New ones lurk on the horizon: the aforementioned villainous Asian Giant Hornet, **Tropilaelaps mites, large hive beetles, and others we haven't discovered yet.**

For a moment, let's give the futurists the benefit of the doubt and imagine a dismal future.

In 2030, scientists will perfect an autonomous mechanized synthetic pollinator swarm. Careful trials on USDA research fields will start with a cash crop. Apples, let's say. Each drone will operate independently, gently pollinating orchards, keeping track of already-pollinated flowers, working with efficiency. Solar-powered, run through a thoughtful artificial intelligence system that selects for white blossoms instead of purple bindweed flowers, crops will continue to have bountiful harvests in spite of the fact that bee sightings are now few and far between.

Meanwhile, in the wild spaces around the farms, in our parks and wilderness areas and highway medians and backyards, wild plants will go season after season without pollination.

THE BEEKEEPER'S ACCIDENTAL LEGACY

Extinctions take time. It took market hunters years to wipe out the buffalo. Globalized diseases, habitat destruction, and chemical application are insidious and slow-moving threats. But if pollinators begin to decline, expect to see accelerated development of synthetic pollination methods.

Yet a beekeeper's hive doesn't operate in isolation. Whether the beekeeper lives in Idaho where the winters are cruel or in tropical Jamaica, a hive represents millions of pollination trips to the landscape. Honey bees shape their home ranges.

So do we allow synthetic pollinators to carouse with our wild plants? With which plants do we permit them to interact?

Garlic Mustard

As I said before, I enjoy the invasive wineberries in my yard during the season. They ripen around July. By then, the black raspberries are done, the blackberries are still green, and the raspberries still need time too. Yet as an invasive berry plant from Asia, they can and do displace our natives. Do they deserve to be pollinated? If we play God, what flora survives?

But would this dearth of indiscriminate, uncooperative pollinators be humanity's chance to rid itself of its most insidious invasive plants? I cleared an entire embankment of garlic mustard last year. The plant contains allelopathic chemicals, poisoning the soil around it. Pennsylvania's deciduous woods are filled with the stuff. Deer don't it eat, but pollinators service it. Could we finally restore Pennsylvania's woodlands to their native state without bees mucking up the careful balance?

These questions seem out of the realm of practical beekeeping. Yet they open up lines of ethical inquiry into how our bees interact with their environment, the role of pollinators in perpetuating undesirable species, and how picky and unpredictable our bees actually are. A homesteader might have goats clear a rocky hillside, but I haven't found a way to intentionally pasture my bees.

But perhaps that's acceptable. It means humans aren't the only species to shape our own environment. Bees, as long as we steward them, will make choices about the flora thriving in the places we make wild.

And in closing, it's important to say that not one of the robots being proposed will make honey. BC

Will Caverly is a beekeeper in Pennsylvania and one of the stewards of Satoyama Homestead. The homestead website can be found at satoyamahs.org, where they maintain a blog and record The Original Transplants podcast.

EDITORIAL

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

FOUND IN TRANSLATION

Holding The Line On Trait Rot And Inbreeding

Jay **Evans**, USDA Beltsville Bee Lab

This month I describe three challenges in bee breeding along with recent efforts to work around those challenges. As a geneticist, I tirelessly support (mostly from a safe distance) programs to improve the resilience of bees through breeding. History has shown that honey bees contain a continuum of behaviors, defenses, and colony-level traits. This variation has been exploited by beekeepers for decades, in hopes of producing queens, drones, workers, and colonies that are best suited to local climates and show desired survival, behavior or productivity traits. Much of the focus of serious breeding programs is on resistance to *Varroa* mites or tolerance of these mites when they are in the hive. There is good news on that front, from survivor stock that limits mite fertility (e.g., work on Norwegian bees by Mellisa Oddie and colleagues (PeerJ, DOI 10.7717/peerj.3956) to stock with varroa-sensitive hygiene (VSH, e.g., Robert Danka, Jeff Harris, and their colleagues at USDA-ARS and Mississippi State University, respectively).

It is hard enough to identify and breed from desired traits, but honey bee breeding efforts also suffer from difficulties in hanging on to those same traits. One phenomenon, which I would call "trait rot", is relentless. Even the best traits get reshuffled each generation, meeting up with additional genes and combinations of genes. At the colony level, desired traits found in worker bees can be further diluted by the sheer diversity of genes across the colony (the "many-dad" syndrome). Unless selection is intense or mating is closely controlled these processes can, and generally do, dampen the strength of initial breeding traits. Were this not the case, breeder queens would not be so pricey relative to their many daughters.

Selection for disease resistance has an added cost in that those being selected against (parasites and pathogens) have their own motives for defeating each resistance trait sent their way. The so-called Red-Queen hypothesis (reflecting the Lewis Carroll character who spends her every minute "running, running, just to stay in the same place") defines this challenge to both human-driven and natural selection. In short, parasites and pathogens are in an arms race with their bee targets and can be quick to adapt to bee defenses. In the case of *Varroa*, selection for mites that beat new host defenses mirrors selection on these same mites to defeat the many acaricides used by beekeepers.

Finally, true genetic winners, whether this is accomplished in nature or with a human hand, can be successful so quickly that they abandon genetic variation that is equally important for the longterm survival of bees. This can lead to direct inbreeding costs (diploid males, for one) or subtle losses of genetic variants that could be needed in the future. One example of the latter would be an immune trait for a periodic disease (chalkbrood, viruses, etc.) that was not present in the population under selective breeding. Bee bred from a closed population, until their genes are vetted and merged into the wider gene pool, could have unforeseen but important weaknesses. This is but one downside of genetically modified bees; if they are overwhelmingly successful against, say, *Varroa* or the viruses tied to *Varroa,* they run the risk of sweeping through bee populations so quickly that millennia of genetic variation is lost.

Given this backsliding, breeders must identify and promote traits that will be robust and available to beekeepers for multiple generations. Writing in *Apidologie* (**DOI: 10.1007/s13592-015-0413-7**) Danka, Harris, and Garrett Dodds show one approach for assessing backsliding, namely screening next-generation bees to see how closely their behaviors match the parent stock. In the case of VSH-selected stock, the authors claim this trait holds up well for one generation of outcrossing, in terms of both the removal of mite-infested brood and total mite loads. Lelania Bourgeois and Lorraine Beaman (also at the USDA-ARS Honey Bee Breeding, Genetics and Physiology Laboratory in Baton Rouge, Louisiana) used a genetic approach to address trait rot with respect to longstanding efforts to breed disease-resistant Russian honey bees ("Tracking the genetic stability of a honey bee (Hymenoptera: Apidae) breeding program with genetic markers" in the *Journal of Economic Entomology*; **doi: 10.1093/jee/tox175**). They first identified a genetic signature for Russian breeding stock using 'chords' composed of eight genetic notes. This signature correctly distinguished individual Russian bees from the rest of the population about 80% of the time in the first year of release. While this percentage dipped the first year after release, it has since held steady, increasing confidence in stock integrity. These same genetic tests are also being used to assess inbreeding levels over time, providing a warning when populations become a bit too closed. Insights into the inbreeding costs of intense selection can be gleaned from natural experiments as

well. In one study that marries multi-year field work with genetics, Michael Lattorff and colleagues were able to show the famous 'Gotland' survivor stock in Sweden lost a substantial amount of genetic diversity between 2000 and 2007. Interestingly, specific regions of the 'Gotland' genome showed exceptionally low diversity, a clue these scientists are using to identify genes that were especially successful, effectively 'sweeping' neighbors on their chromosomes to high frequencies at the expense of other variants. Their study, "A selective sweep in a *Varroa destructor* resistant honey bee (*Apis mellifera*) population" is freely available at **https://doi.org/10.1016/j.meegid.2015.01.025**.

Next month I will focus on genetic resources for honey bees that can speed efforts to identify key *Varroa* resistance traits and keep them in the population. These resources include complete genome sequences for many bee species. Comparing across genomes should identify genetic signatures of bees that present (*Apis cerana*, e.g, a study by Zheguang Li and colleagues, **doi: 10.1002/ece3.3802**) or lack natural roadblocks to *Varroa* reproduction. BC

The Technology Acceptance Model –

Nudging Beekeepers Into The Future

Joseph **Cazier,** James **Wilkes,** Edgar **Hassler**

Introduction

In the April issue of *Bee Culture* we introduced the concept of a Genius Hive. Then in the May issue we made the case for keeping electronic records as a path to better beekeeping. Now we want to discuss efforts to encourage beekeepers to adopt helpful technologies with the application of the *Technology Acceptance Model (TAM)* to electronic record keeping software like HiveTracks.

The *Technology Acceptance Model* is based on one of the oldest theories developed in the field of *Information Systems* and is perhaps the most widely studied area in the discipline. While there are newer extensions of TAM, such as the *Unified Theory of Acceptance and Use of Technology (UTAUT),* we believe that TAM is a better fit for thinking about bees and beekeeping due to its simplicity and to its having withstood the test of time, since Fred Davis[1] introduced it to the discipline in 1989.

In the next sections we will discuss what the *Technology Acceptance Model* is, why we need a framework like this one, and how we are using it at CARE (The Center for Analytics Research and Education at Appalachian State University) and at HiveTracks to help today's beekeepers.

The Technology Acceptance Model

The technology acceptance model was developed as an early theoretical model to measure differences in the rates of acceptance of some of the technologies entering the marketplace. Recall that at this time (in the late 1980s), few people had access to the Internet, email, or the other applications we take for granted today. Therefore, most of the technology was only being used by

Special thanks to Ryann-Rebecca Montgomery and Kiefer Smith, for their help in shaping some of the ideas behind this article and to Wendy Winn for her help with technical editing.

Joseph Cazier is the Chief Analytics Officer for HiveTracks 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***

James Wilkes is the Founder and CEO of HiveTracks. and a Computer Science Professor at Appalachian State University. His lifelong passion for bees keeps fueling the development and mission of HiveTracks software. You can reach him at ***james@hivetracks.com****.*

[1]Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). "User acceptance of computer technology: A comparison of two theoretical models". Management Science, 35, 982-1002.

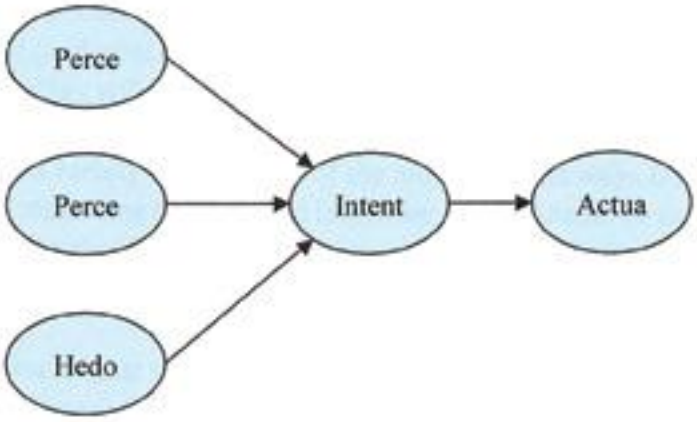


Figure 1. *The Technology Acceptance Model*

midsize to large organizations to help them scale and run their operations more efficiently.

These systems were mostly being developed to help people do better at work and were very task-focused. However, most of the individuals comprising the workforce at the time had little exposure to information technologies and it was difficult for many of them to adjust. Many projects were rejected by workers and failed, resulting in wasted development efforts and lost opportunities.

Given these challenges, academics, and others began a systematic study of the factors that influence user adoption of information technologies in a business context. The two constant factors for the acceptance of work-related information systems are *Ease of Use* and *Usefulness*[2], e.g. the greater a person perceived a system as easy to use and/or useful, the greater the likelihood that he/she planned on using the system[3] at work.

One advantage was that most systems were employer-based and management could tell people to use the system. This made it easier to get people that had never used (or seen) a system to try using it. However, *Ease of Use* and *Usefulness* were still very important in determining their ability to follow through.

Several decades later, after systems migrated out of factories and offices, we added an extension to this theory. This concept was called *Hedonism,* based on a worldview espoused by Aristippus of Cyrene, a student of Socrates, who held the idea that pleasure is the highest good.[4]

Due to its history and the advent of more consumer oriented technologies, the concept of a *Hedonic Information System* was added to the theory by Van der Heijden (2004)[5] to account for consumer enjoyment in systems they use. Today, most people commonly refer to it as the degree of pleasure or enjoyment people derive from using an information system (see Fig. 1).

Thus, the modified or updated *Technology Acceptance Model,* as we have chosen to use it, is based on these three concepts: *Ease of Use, Usefulness* and *Enjoyment.* As the perceptions of any of these factors increase, people are more likely to adopt and use the information system. Sure, other factors such as price, relevance, and accessibility can be relevant, but those are general business issues. This framework focuses on users incorporating the system to their regular work and life patterns after they acquire a system.

In the next section we will discuss why we need a framework like this to build better information systems.

Why We Need a Framework Like TAM

One might ask why we need a system like this and how we can use it. In retrospect, the factors seem obvious enough, though they were less obvious when developed. It can also seem rather simplistic. However it has largely proven itself, with nearly 30 years of research to back it up.

Obvious or not, keeping these factors (*Ease of Use*, *Usefulness* and *Enjoyment*) in mind while developing software systems brings discipline to the software development process. There are always more features that can be added, more tools to try, more complexity to include. Without discipline, it is easy for software and information systems to become bloated, cluttered, or unappealing, and then adoption and usage rates decline.

However, having a framework, even a simplified one like this, sharpens the focus and greatly aids in the software development process. In fact, a simplified system like this one is sometimes better in practice as it helps bring the attention to the few things that really matter: in this case, the three factors mentioned above.

A developer might use this framework in team settings and other meetings to prioritize which possible features to add (and which current features to modify or drop). Additionally features can be ranked on how much they will help or hurt ease of use, usefulness, or enjoyment.

This task can be done in a variety of ways. One of the most common ways is to give each feature a score, say from 1 to 10, indicating how much it improves each of the three factors, then aggregating the results, and prioritizing those that add the most value per unit of effort. Once they are added or prototyped, user feedback can be sought and adjustments made before rollout.

This is the type of process we just went through for our HiveTracks hobbyist and commercial platforms. We will share some of the highlights of the new systems in the next section.

How we are using TAM at HiveTracks

Since the genesis of our first prototype hive management software in 2009, HiveTracks has been in a constant development cycle of

[2]Technically it is perceived ease of use and perceived usefulness. However I have shortened it to the essential elements for readability.

[3]In academic speak, we call these behavioral intentions – in this case the intention to use and adopt a system.

[4]https://en.wikipedia.org/wiki/Hedonism

[5]Van der Heijden, H. (2004). "User Acceptance of Hedonic Information Systems". MIS Quarterly, 28 (4), 695-704

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

Figure 2. *HiveTracks simplified dashboard.*

evaluation and update, responding to user feedback, technology changes, and market demands. In recent years, a recurring message from our users goes something like this, "I love the software and the idea of keeping good records, but I don't use it like I should!" One result of this mindset is inconsistent and incomplete data collection, which makes data analytics challenging. You can see where TAM can help, and we have completed a comprehensive review of the software and are in a sequence of updates using the principles of TAM as a guide. In this section we will give an overview of the software updates we are making.

Hobbyist Platform (hivetracks.com)

If you have ever used HiveTracks, you know the comprehensive nature of the software with its rich feature set and extensive functionality. However, only the most dedicated and disciplined record keepers use the software to its full potential. For most beekeepers it is overwhelming, and they are disappointed and apologetic for not using it like they think they should. We want to change that sentiment.

It is tricky business to redesign an existing software platform, using TAM principles rather than starting over, but at least, for now, that is what we are doing (see Fig. 2). What follows are a few of the recent changes categorized by TAM principles.

Ease of Use

Using a computing device in the bee yard, a hostile environment for technology, is relatively new territory for beekeepers and detailed data entry is a non-starter for most, but we believe it is critical that bee data must be collected as close to the source as possible. The bigger the time gap between observations in the yard and data entry, the bigger the risk of not getting good data or any data at all! Our ease of use changes focus by offering a simple, clean, mobile first user interface design and requiring the fewest number of clicks to get the most valuable data (the second TAM principle).

Usefulness

The immediate utility of HiveTracks is found in the information it can deliver to beekeepers when they need it to make good management decisions. What information is most useful to individual beekeepers? What is most useful to the beekeeping community? What is the minimum amount of data each beekeeper should record to get the most value? Lining up these answers is an optimization problem that we are still working on, but the obvious place to start is to record when you visit a yard. If nothing else, this will help you be more regular in checking your bees and improve your beekeeping. Next is knowing what you did the last time you visited the bee yard and what you observed. Both of these bits of information are essential to knowing what follow-up actions are needed and what you expect to see on the next inspection, e.g., if there was a virgin queen on the last visit, you better come back soon and make sure she has mated and is laying well. Our current update brings these items front and center for the user along with the Healthy Colony Checklist[6] as a quick and informative standard for colony health assessment and *Varroa* mite load monitoring. Of course, the list of useful information is almost endless, but the ongoing questions are what is the most important information and what is worth the time to collect? Stay tuned as HiveTracks continues to shine light on these questions.

Enjoyment

Anyone who has spent much time with honey bees enjoys being in the bees, so being able to extend that enjoyment outside the bee yard is a benefit of HiveTracks. Looking at pictures taken during a yard visit, entering more detailed records and notes in the comfort of your home, and evaluating graphs showing trends in health and production are all ways to connect with your bees outside the bee yard. In addition, the community feature of HiveTracks allows bee clubs and classes, beekeeping friends, and mentors and mentees to share hive information and compare it with others within the application. More social media and gamification ideas are in the works and will further extend the enjoyment options.

Commercial Platform

The commercial beekeeping sector has always shown an interest in the hivetracks.com application and several have used that platform to meet their needs over the years. However, the feedback from most commercial keepers, beginning five years ago, was that they recognized the need for better record keeping, but the required level of detailed data entry would not work in their fast-paced production environment. Furthermore, the current methods most commercial beekeepers adopt for recording yard locations, counts of hives, and management actions

[6]More information on the HCC is available here: https://beehealth.bayer.us/who-can-help/beekeepers/healthy-colony-checklist

use very little technology in both the collection and storage of this data. Based on these factors, we spent two bee seasons designing and building a commercial platform based on a minimalist and ease of use approach, as the only pathway to getting acceptance and use and managing costs. Custom software systems for each beekeeper could work, but are very expensive and difficult to create with software companies that do not understand beekeeping. Many have tried and continue to do so, but our approach is to maintain an agile software framework that is easy to use and useful, while maintaining reasonable costs and flexibility to adapt to new technologies as well as the changing needs of beekeepers.

Following is a brief overview of the HiveTracks Commercial system from the TAM perspective. Note that the system is comprised of a web application that houses the data and offers various reporting and communication features and a mobile app for collecting data in the field.

Ease of Use

For the commercial beekeeper who is managing multiple crews in a distributed work environment that is dynamic and unpredictable, ease of use is a top priority as the field level workers are the ones who must enter data. If crews cannot enter the data quickly and easily within the existing workflow process, the software will not be used. Our commercial mobile app has a super simple interface with predefined options (yards, previous hive counts, purpose of yard visit, feed lists, treatment options) that require only a few clicks for data collection, but also give the option for free form comments and the inclusion of images from mobile phones/tablets. Another issue is language as many workers are not native English speakers, so Spanish language versions of the app are in use. Finally, despite advances in cell phone networks, connectivity remains an issue in many yard locations, so offline capability is now part of the ease of use and is built into the mobile app. Although we have focused on the mobile app here, the web application is also designed for ease of use and provides key hive counts, management actions, images, and maps in a dashboard setting for the owner and staff (see Fig. 3).

Usefulness

Commercial beekeeping is a business and any technology solution has to provide benefit to the bottom line, which means the value added or efficiency gained must be significantly more than the cost of the software. Use cases that clearly demonstrate the benefits are numerous and range from less time required by owners to collect and synthesize daily crew reports for planning the next day's tasks to not forgetting yards in a round of treating/feeding or moving. More timely and accurate information is a key element when adding technology to the beekeeping operation and is achieved by the combination of the mobile app in the field delivering data in real time to the web application. An added operational benefit is the software allows broader access to key metrics, getting important information out of owner's head/hands and to the crews on the ground to assist them in making decisions. This eliminates the time an owner

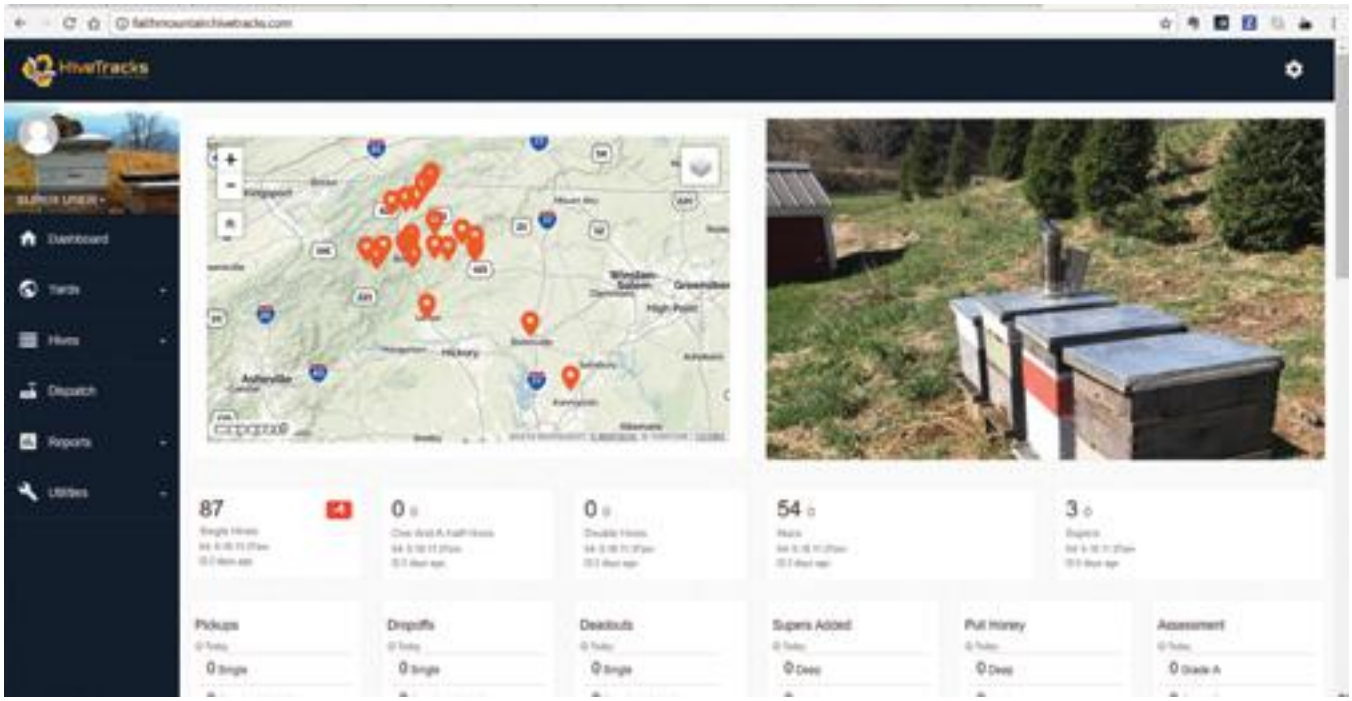


Figure 3. *HiveTracks Commercial dashboard.*

uses to spend communicating these metrics while allowing him/her to still see what is happening. We have only scratched the surface of the value of the software, but can already demonstrate the return far outstrips the investment. We will continue to document and share the benefits as our commercial users gain more experience and find creative uses, which beekeepers are good at doing.

Enjoyment

One could argue that enjoyment is not a high priority for commercial beekeeping software, but there is definitely an element of satisfaction/pride for everyone in the commercial operation when they can see the colony counts in the operation on a graph and the images from the bee yards, visualizing the progress made each day by the crews in real time. Even crew members entering the data gain a sense of inclusion in the business operation and take greater ownership of their role and are empowered to make better decisions with access to information not previously available.

Conclusion

Our goal is to help beekeepers take advantage of the benefits that technology has to offer, eventually leading to the development and use of the *Genius Hive.* One important step on that path is to develop software that people will use to collect and manage their data in a way that can be analyzed to help beekeepers everywhere.

It is our hope that these software updates, based on the principles of TAM, will make our software easier to use, more useful, and more enjoyable for today's beekeepers. There is still more to do, but hopefully these updates will help nudge beekeepers into the future today. If it has been a while since you checked us out, please visit hivetracks.com to review the updates and let us know what you think.

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 for sharing these ideas with an interested audience. BC

A Closer LOOK

A TEMPORAL POLYETHISM

Clarence **Collison**

The regulation of age-based division of labor among workers demands a high level of colony integration.

Honey bee workers perform different tasks as they age and this phenomenon is referred to as temporal polyethism or division of labor (Robinson 1992). After emergence as adults, usually the worker bees first clean cells, and as they age they feed the larvae and queen, process and store food, secrete wax and construct comb, and guard the entrance. The most prominent behavioral change is observed when the bees are about three weeks old, the age when they start foraging (Seeley and Kolmes 1991). Plasticity is an important attribute of division of labor and colonies respond to changes in the internal and external environment by adjusting the ratios of individual workers engaged in the various tasks. This is accomplished in large part via the behavioral flexibility of the individual workers themselves (Robinson 1992).

The regulation of age-based division of labor among workers demands a high level of colony integration. Honey bees generally work in the nest for the first three weeks of adult life and then spend their final one to three weeks foraging, but they can accelerate, retard, or reverse their behavioral development in response to changes in colony or environmental conditions, or both (Robinson 1992). It is important for colony survival and reproduction that bees respond accurately to the need for a particular worker activity because the shift from nest duties to foraging requires complex physiological changes (Winston 1987). Huang and Robinson (1992) studied how workers obtain information that influences one form of plasticity in behavioral development: precocious development, in which bees begin foraging as much as two weeks earlier than average (Winston 1987).

The age at which worker honey bees begin foraging varies under different colony conditions. Several studies have shown that juvenile hormone (JH) mediates this behavioral plasticity, and that worker-worker interactions influence both JH titers and age at first foraging. These results also indicated that the age at first foraging is delayed in the presence of foragers, suggesting that colony age demography directly influences temporal division of labor. Huang and Robinson (1996) tested this hypothesis by determining whether behavioral or physiological development can be accelerated, delayed, or reversed by altering colony age structure. In three out of three trials, earlier onset of foraging was induced in colonies depleted of foragers compared to colonies depleted of an equal number of bees across all age classes. In two out of three trials, delayed onset of foraging was induced in colonies in which foragers were confined compared to colonies with free-flying foragers. Finally, in three out of three trials, both endocrine and exocrine changes associated with reversion from foraging to brood care were induced in colonies composed of all old bees and devoid of brood; JH titers decreased and hypopharyngeal glands regenerated. These results demonstrate that plasticity in age-related division of labor in honey bee colonies is at least partially controlled by social factors.

Siegel et al. (2013) investigated the timing and pattern of preforaging behavior in distinct strains of bees to (1) determine if a general pattern of temporal division of labor exists in honey bees, (2) to demonstrate a direct genetic impact on temporal pacing, and (3) to further elucidate the mechanisms controlling foraging initiation. Honey bees selected for differences in stored pollen demonstrate consistent differences in foraging initiation age. Those selected for increased pollen storage (high pollen hoarding strain, HSBs) initiate foraging earlier in life than those selected for decreased pollen storage (low pollen hoarding strain, LSBs). They found that HSBs both initiate and terminate individual pre-foraging tasks earlier than LSBs when housed in a common hive environment. Unselected commercial bees (wild type) generally demonstrated intermediate behavioral timing. There were few differences between genotypes for the proportion of pre-foraging effort dedicated to individual tasks, though pre-foraging effort differences differed dramatically. This demonstrates that behavioral pacing can be accelerated or slowed, but the pattern of behavior is not fundamentally altered, suggesting a general pattern of temporal behavior in honey bees. This also demonstrates direct genetic control of temporal pacing. Finally, their results suggest that earlier HSB protein (pollen) consumption termination

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 Benevolent Bee
Stephanie Bruneau
ISBN: 9781631592867
Paperback • 160 Pages
$24.99 US/$32.99 CAN

The Quarto Group

compared to LSBs may contribute to an earlier decline in hemolymph vitellogenin protein titers, which would explain their earlier onset of foraging.

There is a genetic component to plasticity in age polyethism in colonies, such that workers of some genotypes become precocious foragers more readily than do workers of other genotypes, in colonies lacking older bees. Using colonies composed of workers from two identifiable genotype groups, Giray and Robinson (1994) determined that intracolony differencs in the likelihood of becoming a precocious forager are a consequence of differences in rates of behavioral development that are also evident under conditions leading to normal development. An alternative hypothesis, that differences in the likelihood of becoming a precocious forager are due to differences in general sensitivity to altered colony conditions, was not supported. In three out of three trials, workers from the genotype group that was more likely to exhibit precocious foraging in single cohort colonies also foraged at relatively younger ages in colonies in which workers exhibited normal behavioral development. In contrast, in three out of three trails, workers from the genotype group that was more likely to exhibit precocious foraging in single-cohort colonies did not show disproportionately more over-aged nursing in colonies in which workers exhibited delayed development. These results indicate that genotypic differences in plasticity in age-related division of labor are based on genotypic differences in rates of behavioral development.

Brillet et al. (2002) measured the age at onset of foraging in colonies derived from three races of European honey bees, *Apis mellifera mellifera*, *Apis mellifera caucasica* and *Apis mellifera ligustica*, using a cross-fostering design that involved six unrelated colonies of each race. There was a significant effect of the race of the introduced bees on the age at onset of foraging: cohorts of *A. m. ligustica* bees showed the earliest onset, regardless of the race of the colony they were introduced to. There also was a significant effect of the race of the host colony: cohorts of bees introduced into mellifera colonies showed the earliest onset of foraging, regardless of the race of the bees introduced. Significant inter-trial differences also were detected, primarily because of a later onset of foraging in trials conducted during the Autumn (September-October). These results demonstrate differences among European races of honey bees in one important component of colony division of labor.

Toth and Robinson (2005) investigated whether there is an association between nutritional state (as indicated by stored abdominal lipid amounts) and division of labor. They found that foragers (typically older bees) had lower lipid amounts than did nurses (typically young bees). Results from experimental colonies that contained nurses and foragers of the same age showed that the lipid decline in foragers was not attributable to age. Analysis of bees with different amounts of foraging experience revealed little effect of the act of foraging on lipid stores. Lipid levels were low even on the first day of foraging, suggesting that the decline in stored lipids precedes the onset of foraging. They also found that bees that revert from foraging to nursing did not regain their lipid stores, indicating that high lipid stores are not required to sustain brood care behavior. This demonstration of a robust association between reduced lipid stores and the transition to foraging

Building beeswax.

suggests that worker nutritional state may be involved in the regulation of division of labor in colonies.

Hormone analysis and exocrine gland measurements were made to probe for physiological correlates of division of labor among similarly aged adult worker bees. Middle-age bees (ca. two weeks old) performing different tasks showed significant differences in both juvenile hormone (JH) biosynthesis rates and hemolymph titers; guards and undertakers had high JH, and wax producers and food storers, low JH. Guard and undertakers had similar hormone levels to foragers, even though they were 10 days younger than foragers. No differences in JH were detected among young bees (one-week-old queen attendants and nurses) or older bees (three to four week-old pollen foragers, non-pollen foragers, and soldiers). Hypopharyngeal gland size was inversely correlated with worker age and rate of JH biosynthesis, but soldiers had significantly larger hypopharyngeal glands than did foragers, despite their similar age and JH level. Results from soldiers indicate that exocrine gland development is not always linked with age-related behavior and endocrine development; they also support the recent claim that soldiers constitute a group of older bees that are distinct from foragers. Hormonal analyses indicate that the current model of JH's role in honey bee division of labor needs to be expanded because high levels of JH are associated with several other tasks besides foraging. JH may be involved in the regulation of division of labor among similarly aged workers in addition to its role in age-related division of labor (Huang et al. 1994).

Division of labor has been classically viewed as a sequence of age-related changes in task performance. Some have questioned whether there is any age-related within-nest specializations associated with house bees. Johnson (2008) investigated whether nurses (typically aged four to 12 days) and middle- aged bees (aged 12-20 days) have distinct task repertoires. A large number of workers in both age groups working within the same nests at the same time were observed. The results support their being two castes of within-nest bees. Young bees specialized on brood care tasks, while middle-aged bees

Foraging for water.

specialized on nectar processing and nest maintenance. Middle-aged bees were observed caring for brood in less than 1% of the observations. Moreover, both castes exhibited movement patterns that correspond to the traditional view that nurses stay within the broodnest, while middle-aged bees move around a great deal in search of work throughout the nest.

In honey bees, the adult work force may be viewed as divided between non-foraging hive bees that rear brood and maintain the nest, and foragers that collect food outside the nest. Honey bee brood pheromone is a larval pheromone that serves as an excellent empirical tool to manipulate foraging behaviors and thus division of labor. Sagili et al. (2011) used two different doses of brood pheromone to alter the foraging stimulus environment, thus changing demographics of colony division of labor, to demonstrate how division of labor associated with brood rearing affects colony growth rate. They examined the effects of these different doses of brood pheromone on individual foraging ontogeny and specialization, colony level foraging behavior, and individual glandular protein synthesis. Low brood pheromone treatment colonies exhibited a significantly higher foraging population, decreased age of first foraging and greater foraging effort, resulting in greater colony growth compared to other treatments. This study demonstrates how division of labor associated with brood rearing affects colony growth rate, a token of fitness.

Guarding the front door.

Some worker honey bees respond to major disturbances of the colony by flying around the assailant and possibly stinging; they are a subset of the bees involved in colony defense. These defenders have an open-ended age distribution similar to that of foragers, but defensive behavior is initiated at a younger age than foraging is. Behavioral and genetic evidence shows that defenders and foragers are distinct groups of older workers. Behaviorally, defenders have less worn wings than foragers, suggesting less flight activity. Genetically, defenders differ in allozyme frequencies, demonstrating different subfamily compositions from foragers in the same colony. They also differ in allozyme frequencies from guards in the same colony providing further evidence for division of labor associated with colony defense (Breed et al. 1990). BC

References

Breed, M.D., G.E. Robinson and R.E. Page, Jr. 1990. *Division of labors during honey bee colony defense*. Behav. Ecol. Sociobiol. 27: 395-401.

Brillet, C., G.E. Robinson, R. Bues and Y. Le Conte 2002. *Racial differences in division of labor in colonies of the honey bee* (Apis mellifera). Ethology 108: 115-126.

Giray, T. and G.E. Robinson 1994. Effects of intracolony variability in behavioral development on plasticity of division of labor in honey bee colonies. Behav. Ecol. Sociobiol. 35: 13-20.

Huang, Z.-Y. and G.E. Robinson 1992. *Honeybee colony integration: Worker-worker interactions mediate hormonally regulated plasticity in division of labor*. Proc. Natl. Acad. Sci. USA. 89: 11726-11729.

Huang, Z.-Y. and G.E. Robinson 1996. *Regulation of honey bee division of labor by colony age demography*. Behav. Ecol. Sociobiol. 39: 147-158.

Huang, Z.-Y., G.E. Robinson and D.W. Borst 1994. Physiological correlates of division of labor among similarly aged honey bees. J. Comp. Physiol. A 174:731-739.

Johnson, B.R. 2008. *Within-nest temporal polyethism in the honey bee*. Behav. Ecol. Sociobiol. 62: 777-784.

Robinson, G.E. 1992. *Regulation of division of labor in insect societies*. Annu. Rev. Entomol. 37: 637-665.

Sagili, R.R., T. Pankiw and B.N. Metz 2011. *Division of labor associated with brood rearing in the honey bee: how does it translate to colony fitness?* PLoS ONE 6(2): e16785. doi:10.1371/journal.pone.0016785

Seeley, T.D. and S.A. Kolmes 1991. *Age polytheism for hive duties in honeybees-illusion or reality*. Ethology 87: 284-297.

Siegel, A.J., M.K. Fondrk, G.V. Amdam and R.E. Page, Jr. 2013. *In-hive patterns of temporal polyethism in strains of honey bees* (Apis mellifera) *with distinct genetic backgrounds*. Behav. Ecol. Sociobiol. 67: 1623-1632.

Toth, A.L. and G.E. Robinson 2005. *Worker nutrition and division of labour in honeybees*. Anim. Behav. 69: 427-435.

Winston, M.L. 1987. *The Biology Of The Honey Bee*. Harvard University Press, Cambridge, MA, 281 pp.

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

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!

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

THE HIVE MIND

A wide scale information collecting network such as the honey bee colony functions as well as it does because it cleaves to one purpose, the survival of the colony.

When I first got interested in honey bees, I had this feeling there was something unknown waiting to be discovered in the darkness of the hive. I guess I am not the only one; from the book *Swarm Intelligence*:

> Our study of swarm intelligence and collection adaptation is motivated in part by the uninformed suspicion there is wisdom to be gained from it, and by the feeling that there is something about the disorderly interactions of dumb actors and their achievements that is just, well, fascinating. (Kennedy 2001).

But are they dumb actors, or just very focused on a single purpose? There are thousands of species of bees and wasps, and very few live in colonies or hives. Most of them are *solitary bees*; solo females that raise the next generation and don't stay around long enough to even see them emerge from their nurseries.

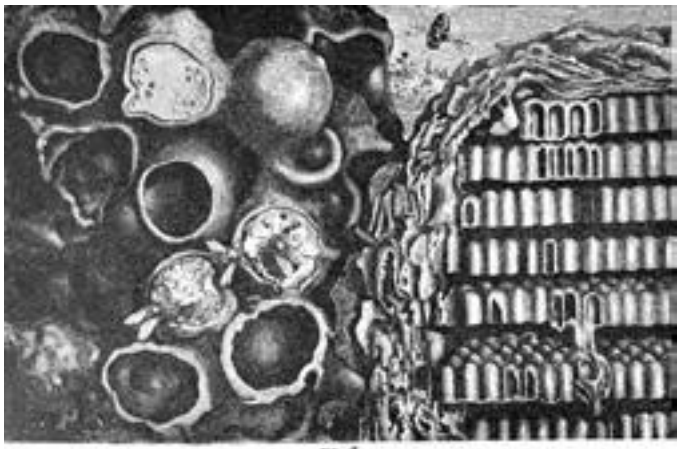
Solitary Bees

John Lubbock, in *The Senses, Instincts, and Intelligence of Animals with Special Reference to Insects* says: "The hive bee and the common wasps are so familiar and so interesting that they have to a great extent diverted attention from the so-called solitary species of the same groups." We have little idea of when bees began to live in groups, but it is a wonderful fact that we can observe the range of life styles in bees living today. A small number of the solitary species form aggregations which hint at what might be accomplished if they established a more cooperative union.

The species *Agapostemon* (green sweat bee) lives in underground burrows and is known to form large "communes" of two hundred or more females. They have no division of labor, but gain the advantage of collective defense of the developing young. This arrangement gives a survival advantage to the individual members and so evolution would favor bees that live in shared burrows. The question then becomes whether solitary bees behave instinctively or exhibit some form of intelligence that responds in novel ways.

"In considering the question whether these remarkable instincts were originally, so to say, engrafted in the insect – the very repetition which gave such remarkable results would tend to incapacitate the insect from dealing with any unusual conditions (Lubbock 1889)." Again, they are branded dumb actors: "one of the most striking instances of stupidity."

The solitary bee, *Megachile pyrenaica*, makes mud cells. Little by little, she constructs a cell and fills it with honey. When it's full she places an egg inside and seals the small opening with mud. The renowned naturalist Fabre, curious to explore the bee's instincts, removed some of the mud, which she quickly repaired. Then, he made a small hole in the side of a cell, from which the honey began to drip out. Apparently, the bee had no instinct to deal with this. She simply kept putting in more honey, and the contents leaked out. There are countless similar examples throughout the animal world that illustrate the limits of instinct, and the need for creative solutions to unforeseeable problems.



Portion of nest of *Melipona seminigra*, showing brood-comb (to the right) and the large honey pots and pollen pots (to the left). Sublagrammatic drawing from Emile Blanchard.

Evolution has produced many solutions to this dilemma. On the one hand, we see animals with large brains that combine instinct with problem solving capabilities. Alternatively, there are many species, having a very limited degree of awareness and intelligence, that have formed aggregations. This collective intelligence is what makes a "hive mind."

The Hive Mind

One of the earliest references to the hive mind occurs in the magazine *Bee World*. H.J. Wadey discusses honey bee orientation and he mentions a friend who suggested bees may be connected to their colony by a "thought beam" analogous to RADAR. Wadey immediately dropped that idea, but continued with the concept. He described how swarming bees keep together and form a new identity, once they have left the parent stand, "which might have ceased to exist for all the interest the swarm shows in it" (Wadey 1944).

They begin to form new memories associated with the new colony and ultimately its new location. He points out that the new identity is so strong, that they will not return to their former location, even if the queen is removed from the swarm. The exception to this keen sense of hive location is the phenomenon called "drifting," which Wadey correctly points out is purely accidental. The older bees returning from the field have the strongest tendency to drift. It is likely that their mental abilities fade with age. Further, they are not rejected by guard bees, since they are not hostile invaders but just returning from the field with bounty.

The idea of the hive mind did not catch on right away. It was mentioned in passing by Stanley Gooding, the president of the British Bee-Keepers' Association, in a 1958 address. He refers to:

> Something which we might call the 'Hive Mind' ... the needs of the colony itself. Work has been carried out by Lindauer, in Germany, upon the behaviour of dancing honey bees on the surface of a swarm. This rather points to honey bees being able, on occasions, to exercise a certain degree of choice which might be considered intelligence (Gooding 1958).

Colin Butler carried the idea forward in his 1973 presentation to the Royal Entomological Society of London. Butler referred back to Maeterlinck's fanciful work called *The Spirit of the Hive*, and gave a nod to Wadey's updated version. However, he moved the discussion away from intelligence and toward the recently discovered role of pheromones. Butler attributed much of the regulation of the colony to the queen and the "queen substance" which has such a profound effect on the entire group, even at a distance. Certainly the use of odoriferous pheromones plays an important part in the lives of insects.

Naturally, these discoveries did not escape the notice of science fiction writers. In *Hellstrom's Hive* (1973), Frank Herbert writes about human beings that have mutated into a hive-group, which is preparing to take over the world, complete with broodmother queens, drones, and chemically neutered "workers." This theme was previously explored in Huxley's *Brave New World* (1932), and subsequently used in countless dreary stories and films. The font for these fictions was the entomologist William Morton Wheeler, who coined the term superorganism in his 1928 book titled *Emergent Evolution*.

> Wheeler saw "emergent properties" within the superorganism superseding the resident properties of the collective ants. Wheeler said the superorganism of the hive "emerges" from the mass of ordinary insect organisms. And he meant emergence as science – a technical, rational explanation – not mysticism or alchemy . . . The marvel of "hive mind" is that no one is in control. (Kelly 1994).

A colony of honey bees can live for many years in the same location while most insects live very short, seasonal lives.

So writes Kevin Kelly, who connected the dots in his book, *Out of Control,* in which he extensively used the metaphor of the hive mind. Kelly had previously edited, published, and wrote much of *Signal, a Whole Earth Catalog of Personal Communication Tools*, which evaluated the technologies of faxes, satellite TV, cellular, digital retouching, online systems and the whole emerging world of digital technology. His thinking was prescient, in that he was able to foresee the emergence of a new form of intelligence from the network that was just beginning to form as personal computers were being linked around the world. He said, in 1988, "The complexity in question permeates key concepts like distributed learning (honey bees co-operating in a hive), and fault tolerant networks (a downed powerline doesn't topple the electric grid)." Kelly and his colleagues developed the *WELL (Whole Earth 'Lectronic Link*), which was one of the earliest online computer conferencing networks (Kelly 1988).

Swarm Intelligence

Meanwhile, modern day researchers were hard at work probing the minds of insect colonies. While Kelly was in Sausalito dreaming about hive minds, Tom Seeley was a professor at Yale (1980 to 1986) and after that, at Cornell University. His first major work was *Honeybee Ecology: A Study of Adaptation in Social Life*. In a more recent work,

he wrote at length about the honey bee waggle dance, which the bees use to transmit information about their discoveries in the field, to other potential foragers, thereby optimizing the workforce.

> The waggle dance increases a colony's ability to collect food not only because it helps a colony's foragers exploit food sources that are hard to find, but also because it helps them focus their efforts on the food sources that are best to exploit. In other words, the ability of a colony's foragers to share information about food source location and quality endows the colony with a collective decision-making ability, or "swarm intelligence", regarding where its foragers should work (Seeley 2012)

It is quite clear that a colony or superorganism is far more efficient than that number of individuals living independently. A colony of honey bees can live for many years in the same location while most insects live very short, seasonal lives. Some of this efficiency arises from teamwork, division of labor, and sheer numbers, but the colony also possesses a collective awareness that none of the individuals has.

This awareness is transmitted from individual to individual and is retained even as thousands of bees are lost daily from attrition. In other words, once a large patch of forage, or a reliable water source, is located, the memory of this is retained by the colony, even if the discoverers of it have long since passed on. By the same token, bees that habitually visit sites don't live more than few weeks, so that memories can also fade when they are no longer valid.

> Cognition stresses the intrinsic organizing capacity of the brain. This capacity is expressed best in faculties of active or working memory including directed attention, expectation, decision making, planning, rule extraction, spatial cognition, and communication. Focusing on these capacities of the brain requires a shift from a learning perspective to a memory processing perspective (Menzel 2012).

It is already clear that the honey bee possesses a strong memory for and sense of location. But without the ability to communicate, this would be a private experience only. The dance communication system takes the behavior to the next level. It isn't really helpful to imagine the honey bee colony as a big brain, nor to think of the bees themselves as cells or neurons in the brain. It is much more like a network of cars, similar to a mapping program that one can access on one's smart phone.

These networks collect information about traffic conditions from autonomous drivers who are actually in traffic. This information is fed back to other drivers and without any oversight, traffic is optimized, simply by the information being collected and fed back. Obviously, this information is available to you, even after you have arrived at home. The consciousness of it is alive and ongoing. But without memory there can be no consciousness. In this way the individual bee's memory becomes the repository for one facet of the collective memory of the hive mind.

> Our consciousness creates the present, just as it creates the past, from many distributed clues scattered in our mind. Our memories (and our hive minds) are created in the same indistinct, haphazard way. The act of perceiving and the act of remembering are the same. Both assemble an emergent whole from many distributed pieces (Kelly 1994).

Honesty is the Best Policy

One of the most important aspects of a networked solution is honesty. For the system to work the members have to report accurately and without trying to coerce the group. An example of coercion is *advertising*. If a mapping program, for example, is biased by businesses trying to reroute traffic to their establishments, the program completely loses its value as a navigational tool, the purpose of which is to get from here to there efficiently. That is not to say that advertising is inappropriate; the users of map programs frequently rely on them to find goods and services. But the bees have no particular bias; the foragers report back on their findings as fairly as possible.

Seeley's more recent work from *Honeybee Democracy* (2010) described how honey bees scout for new nest sites, soon after a swarm of bees alights on a branch or some other situation, referred to as a *bivouac*. Many scouts search the surrounding area for suitable homes. Once a scout has found one and evaluated it (how the bee does that is a marvel; it seems to have an innate set of requirements, much like a nesting bird) – then the bee returns to the colony and advertises the value of the site. They use the same waggle dance that bees use to announce nectar sources and to pass on the location to the follower bees. These recruits go evaluate the site, and report back.

The key to this system is honesty. The bees accurately report the quality of the site. If it is a terrific one, they lobby hard for it; if not, they simply give the information so that it will be available to the group, if there are not better choices available. This is quite the opposite of a human election, where the candidates all present themselves as

the best for the job, while the voters are left to choose from a dubious lot who want to get elected for all the wrong reasons.

Psychology of Superorganisms

Returning to memory, Sasaki and Pratt (2018) ask the searching question:

> If colonies learn, where exactly does the learning happen? Is it within the brains of individual insects, as a foraging bee learns the location, color, and odor of a rewarding flower? Or is learning somehow dispersed across the colony and its environment?

They reiterate the fact that memories are retained collectively by increasing numbers of individuals, but they also include the role of chemicals. They refer to ants which leave marks on nests sites that they find to be non-suitable to deter other scouts from wasting their time on them. Certain species of bees similarly mark forage sites to help guide recruits. Beyond those examples, we know that when honey bees are actively engaged in the collection of nectar and pollen, the hives are permeated with fresh odors and flavors. This creates and reinforces a dynamic not unlike a marketplace, where the goods are displayed for all when the harvest is good and the tables are bare when it is not. These cues stimulate the actions of the hive bees, which busy themselves building new comb for honey storage, cleaning out old comb, and expanding the brood rearing activity in response to favorable conditions.

Another form of colony memory is observed when a bee hive has been molested, say by a skunk. This annoyance has the effect of putting the colony on alert, and they will respond to any sort of disturbance much more quickly and aggressively than if they had been quiescent for a long period of time. Honey bees produce a strong penetrating odor (*isopentyl acetate*) that serves as an alarm to rouse the colony defense. Quite an appropriate tool to get a message quickly to all the individuals in the darkness of the hive or at a short distance from it; they have no other way of calling out to their nest mates.

The Future of the Hive Mind

At various times in history, people have looked at the colony and seen a reflection of their own predilections and desires. Centuries ago, it was thought that the King ruled the hive and the rest of its inhabitants were not much more than slaves, reflecting society at the time. Later, poets like Maeterlinck speculated about the *Spirit of the Hive*. Dystopian science fiction authors write of dire futures where human life degrades into meaningless toil for unseen masters. Other writers visualize the internet as a democratizing force that freely disperses information to the benefit of everyone, albeit for mundane goals such as shopping or collecting antiques. Jaron Lanier warned:

> Every attempt to create a pure bottom-up, emergent network to coordinate human affairs also facilitates some new hub that inevitably becomes a center of power, even if that was not the intent. The whole supposedly open system will contort itself to that Sovereign Server, creating a new form of centralized power. More openness doesn't work (Lanier, 2014).

Which brings us back to honesty. A wide scale information collecting network such as the honey bee colony functions as well as it does because it cleaves to one purpose, the survival of the colony. There is no cheating, no freeloading. However, it does have its dark side. When conditions are poor, the scouts begin looking for other colonies that are weak and poorly defended. Having found one such unfortunate, they will plunder its reserves until every individual is either beaten or left to starve.

Parting Shots

> Self-organizing is a paradigm, and like all paradigms, it is socially constructed; the social and historical contexts give us perspective on the possibilities and limits of the stated knowledge claims (Rodgers 2012).
>
> Bees were for us like the clouds; each of us saw in them what he wanted to see (Dorat-Cubières 1793).

One of the things I do when I am teaching beginning beekeepers is have them look at a frame covered with bees and ask them what they see. The answer is invariably: thousands of bees milling about. A commercial beekeeper would look at the same frame and say: six more weeks of hard labor. At this point, I am torn between seeing the hive as the extension of the queen's genomic program, and as a beautiful cloud of brightly colored sprites. BC

Bill **Ruzicka**

Treatment Timing

Dear Friends:

During the hot part of the season I receive many calls and Emails: IM BEING TOLD THAT IN THIS HEAT I CANOT USE FORMIC ACID. It is on Mite away and on Medivet labels.

The HEAT and Weather: that kills Queens and brood like MITAWAY, sterility of drones and all other rumors has nothing to do with Formic acid itself. They are all results of bad flash and blast methods of its application.

The continuous slow and low dose methods like Mitegone do not have those problems as they use remarkable ability of bees to maintain the brood temperature and humidity, there for are not outside weather and temperature dependent.

I got this answer:

Hi Bill,

I agree completely with your statement about timing of mite treatments. Lloyd Harris studied the age structure of bees in colonies in Winnipeg for his Mac degree. My student Heather Mattila reinterpreted his data and was able to demonstrate when Winter bees are produced. In the prairies (Winnipeg), the first Winter bees are emerging in late August, with the bulk of them having emerged by 25 September. That means that mite levels need to be much reduced by 15-20 August to prevent damage from mites during the sealed brood stage.

Mattila, H.R., J.L. Harris, & G.W. Otis, 2001. Timing of production of winter bees in honey bee (*Apis mellifera*) colonies. *Insectes Sociaux* 48: 88-93.

Probably here in southern Ontario the timing is shifted later by 10-14 days, but nevertheless your statement is correct: treat bees in August to prevent damage by mites and the viruses transmitted by them. By September, the game is over.

Gard W. Otis, Professor
School of Environmental Sciences
University of Guelph

Gard then wrote the summary of this paper.

WHEN ARE "WINTER BEES" PRODUCED IN COLONIES?

Mattila, H.R., J.L. Harris, & G.W. Otis, 2001. Timing of production of winter bees in honey bee (*Apis mellifera*) colonies. *Insectes Sociaux* 48: 88-93.

Mattila and Otis, 2007. Dwindling pollen resources trigger the transition to bloodless populations of long-lived honey bees each autumn. *Ecological Entomology 32: 496-505.*

Summary by G. W. Otis, 2017.

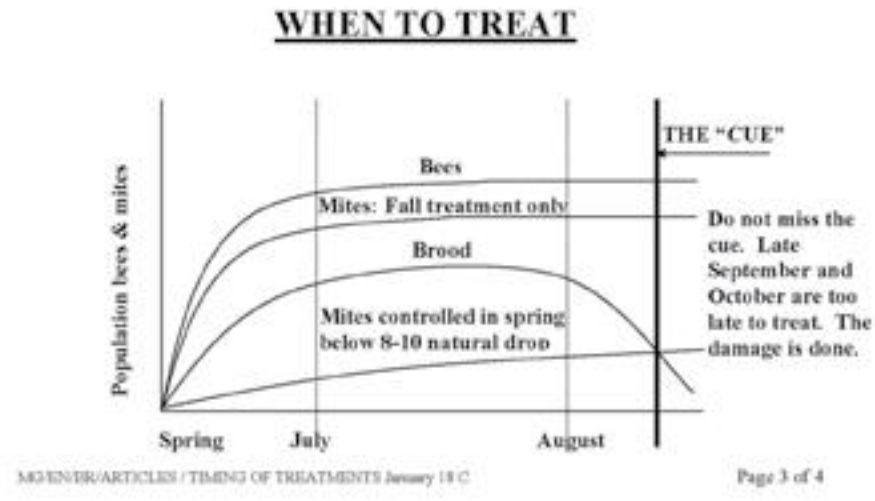
Twenty years ago I asked the question: When are Winter bees produced? I was interested in this question from a practical standpoint: when should beekeepers have *Varroa* mite populations in their hives under control if they want good overwintering success and strong, healthy colonies in Spring?

As luck would have it, Lloyd Harris had studied the age structure of bees in colonies in Winnipeg for his MSc degree. He established colonies from two-lb packages (approximately 7000 bees) and released the queens on 25 April, 1976. Starting on 14 July, he introduced cohorts of newly emerged bees into colonies at 12 day intervals, and then recorded the numbers alive in each cohort every 12 days thereafter. From these data he determined the age structure of bee colonies under different late Summer re-queening methods as well as in control colonies. Within his data lay the answer to my question, but it was difficult to visualize the answer. I recruited then undergraduate student Heather Mattila to reinterpret his data and demonstrate when Winter bees are produced.

Heather's reanalysis of the data yielded somewhat surprising results. In the prairies (Winnipeg), the first newly emerged bees that became long-lived "Winter bees" were recorded on 31 August. For that Aug. 31 cohort, approximately 60% died before Winter (before 1 November), while 40% became "Winter bees." Twelve days later, 70% of the bees became long-lived Winter bees, with the proportion of "Winter bees" increasing with time until the last bees emerged around the end of October. With the large amounts of sealed brood present at the end of August and early September, even though only a proportion of the bees emerging during that time period join the Winter bee population, more than half (53%) of the Winter bee population had emerged by 12 September. Not many worker bees emerged after 6 October.

THE IMPLICATION OF THESE RESULTS:

If a beekeeper has not controlled *Varroa* mite populations earlier in the year and wants to treat hives at the end of the season so that they contain healthy bees going into the Winter (i.e., bees that have not been fed upon by *Varroa* mites or had viruses injected into them through mite feeding), then he/she should reduce mite levels before significant numbers of Winter bees have been produced. As an example, if beekeepers want to control *Varroa* mites in their colonies by 31 August when the first Winter bees are emerging as adults in the prairie provinces, then miticide treatments should be applied before 17 August; that is the date when worker larvae are being sealed



into their cells that will emerge as adults on 31 August. If beekeepers wait until 1 September to treat their hives, approximately 55% of the bees destined to become winter bees will potentially already have been fed upon by mites.

Heather Mattila subsequently studied the effects of the amount of pollen entering colonies in Ontario in September on the transition to Winter bees (Mattila and Otis, 2007). In the control colonies (i.e., the colonies in which the amount of pollen was not manipulated), no Winter bees developed among the bees introduced to colonies on 1 September. However, by 13 September, about 40% of the young bees that were introduced into colonies became Winter bees. Those bees would have been sealed into their brood cells at the beginning of September. These data indicate that the transition from Summer to Winter bees occurs about two weeks later in Ontario than in southern Manitoba. We do not have comparable data for the lower mainland of BC or the Maritime Provinces. However, the same process, i.e., a gradual increase in the proportion of Winter bees among emerging workers over time, undoubtedly occurs everywhere as pollen foraging declines in Fall. Note that feeding additional pollen or a high quality pollen substitute in Fall would delay this transition to Winter bees.

In summary, to have healthy worker bees over the Winter, *Varroa* mites need to be controlled by the time the first Winter bees are emerging in colonies. That means miticide treatments should have been applied by mid August in the Prairie Provinces, the first of September in Ontario, and probably by mid September in the lower mainland of BC. Beekeepers must also remain vigilant as the fall progresses because the numbers of *Varroa* in colonies can increase quickly if nearby colonies are collapsing from high mite infestations.

Gard W. Otis
School of Environmental Sciences
University of Guelph

I have been preaching this fact of how and when to treat for the past 20 years. The graph below has been on my website since 2007. In Canada, beekeepers must treat at the following times for the treatment to be effective. Dates are:

- Prairies - August 17,
- Ontario - end of August
- British Columbia (Okanagan Valley) - August 25
- British Columbia (Lower Mainland) - beginning of September.
- USA (California Almond Pollinators) – February
- USA (Florida) - October 15

Any beekeeper can establish his own "CUE" Day. It is when the queen reduces laying at the end of the Summer from many to only a few frames. Your own "D"date to treat will be just few days earlier.

KEEP MITES BELOW Eight -10 MITES

Spring and late Summer natural drop prorated to 24 hours Treat twice per year

- In the late Summer treat before mites cause damage to brood that will become Winter bee stock. Leave pads in until Spring for reuse.
- In the Spring treat before extensive brood build up, when you are reversing hives or preparing for pollination.
- It prevents reinfestation from collapsing colonies: Which happens in both above time but Long lasting MITEGONE treatment kills the mites drifting on bees before they can get to brood,
- In sub-tropical climates, treat hives at the beginning and at the end of the driest part of the year. BC

Replaceable?

Stephen **Bishop**

Proper beekeeping jargon dictates that the term *hive* means the box, the boards nailed and glued, which house the many thousand bees, the *colony*. A colony is a super-organism of individual bees who work themselves to death all for the greater good of the colony. The queen, as her title indicates, is important; she is an egg laying machine fueled with royal jelly by her ladies in waiting, a group of worker bees attending her needs. Still, the queen like all bees is replaceable. If something is amiss, mainly if her egg production drops too low, workers begin supersedure, the process of raising a new queen. Most of you know all this. The point here is that all this occurs under the nose of the old queen. For reasons unknown, it's unclear why some colonies allow the old queen to live out her days, a peaceful transition, or why others ball her. A vibrating mass of worker bees mob the old queen causing death by overheating.

The queen is dead. Long live the queen.

Frustration is as contagious as foulbrood. And this month's column is mostly me being foul, so take it with a big grain of salt. Today a frustrated farmer has told me I work for him, that all USDA, Extension, farm supply staff, corporate seed reps and agronomists work for him. Without farmers, we wouldn't have jobs. I agree. In fact, we wouldn't eat.

Furthermore, when county economic development staff attended a meeting of our Farmland Preservation Board to learn about opportunities for economic development within agriculture, one staff member said the perception is farmers are lone men on tractors, a few individuals and thus few jobs. Nothing could be further from the truth, we reassured him. Farmers are few but their support staff is legion. The coterie keeps them productive – planting corn, raising chickens, feeding the world.

Still, the farmer is outraged. His point of grievance is often the fact the coterie is supposed to be helping him and not doing a good job of doing so. He should know by now. He was involved in a seed company's grand inquisition in the county, paid his fine. He has poultry houses and is now being forced to upgrade or risk losing his contract. Again, he tells me we work for him. He understands I can do nothing. He wants to vent. Currently, he is upset that the USDA county average for soybeans is 28 bushels per acre. This seems low. Federal crop insurance pays only for the loss in yield up to the county average. In this drought year, if the county average reflected yields in recent years, say around 35 bushels, more money would go into his pocket. But updating the county average is a shrouded and convoluted process with three different federal agencies (RMA, NASS, and FSA) involved; phone calls have been made to Raleigh, to Washington, but no one can explain the entire protocol for updating the average. The frustrated farmer threatens to call Washington himself, his representatives and senators. He says they work for him.

The problem is they don't. (Of course, I don't tell him that, but instead nod my head in affirmation.) They receive hefty campaign donations from agricultural conglomerates, not individual farmers. In modern agriculture, it sometimes seems individual farmers matter only in as much as they keep producing according to protocol. If production drops, if something is amiss, the colony begins the process of supersedure. Modern agriculture resembles a super-organism, pampering individual farmers until they buck the system. Then it's get big or get out, buy our patented super seeds yearly or face fines or lawsuits (or bankruptcy in one case here), upgrade poultry houses or lose the contract. The individual farmer is replaceable. Don't get me wrong, I love and appreciate super-organisms and their productivity, bees and agriculture both, but even still I feel a tinge of remorse when I have to smash a queen – or when I see an individual farmer being smashed.

And in all this frustrated contemplation, I sometimes wonder if the process of replacing American beekeepers is also before us, happening right under our nose – self-fertile almond trees are being tested and planted in California, China is suddenly Johnny Almond Seed and has greatly expanded almond plantings, and honey laundering has already deflated bulk prices for those not wanting to pollinate. But what can and should individual beekeepers do – go along peacefully or risk getting balled? I plan to go peacefully. In fact, I think I'll buy a Flow Hive and plumb a line straight from hive to kitchen pantry, thus replacing myself. BC

Sleep Deprivation

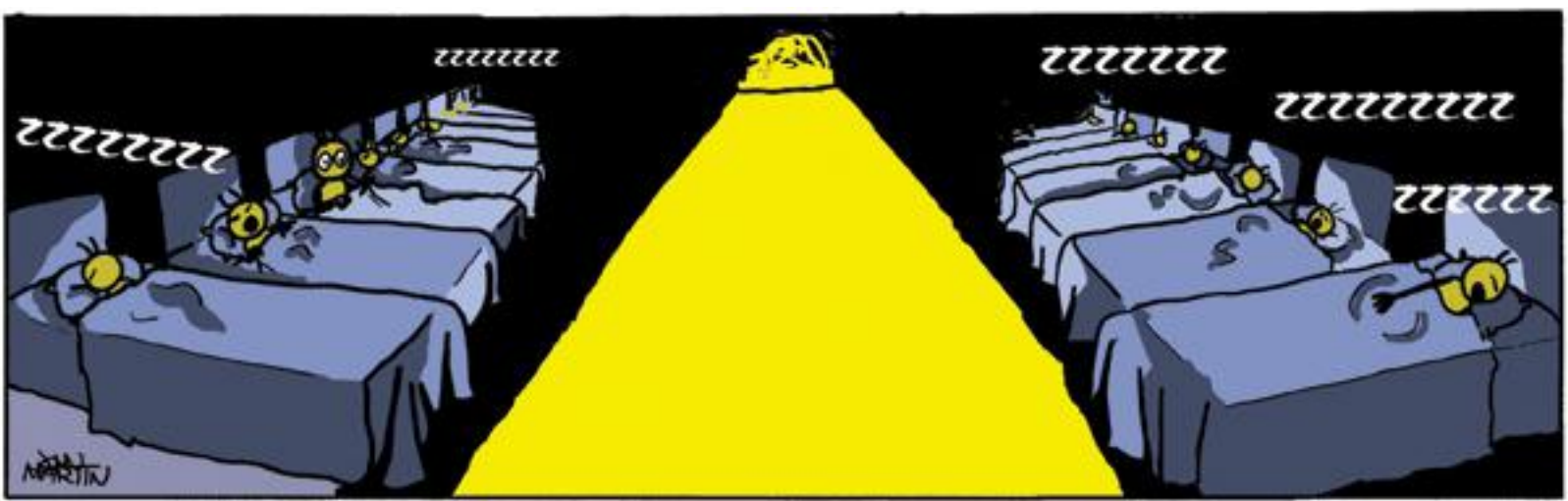
Antonia **DeGroot &** Gard **Otis**

It may come as a surprise to learn that honey bees sleep, and that sleep is a fundamental part of many different aspects of honey bee health. It is well known how important sleep is for humans, and how sleep deprivation can negatively impact many aspects of our lives. The negative effects of sleep deprivation are remarkably similar in insects (see review by Helfrich-Förster, 2018). But how does sleep deprivation affect honey bees? In order to answer this question, we will break it down into four aspects: i) an introduction to the mechanisms and consequences behind sleep deprivation; ii) how sleep deprivation affects communication; iii) how sleep deprivation affects memory; and iv) speculations and future research directions.

In 1983 the first paper was published that concluded that insects do, in fact, sleep (Kaiser & Steiner-Kaiser, 1983). The researchers determined that when a honey bee is resting, its behaviour is comparable to that of humans, other mammals and birds when they are sleeping (Kaiser, 1988). These behavioral characteristics include a reduction of muscle tone, lowered body temperature, decreased movement and a reaction threshold higher than normal (meaning that it takes a larger stimulus such as sound, movement, or light, to disturb a sleeping bee than it would if that same bee were awake) (Kaiser, 1988). Kaiser & Steiner-Kaiser also determined that bees prefer dark conditions while sleeping, compared to light conditions. This finding indicates that bee sleep is controlled by an internal circadian rhythm, that is, an approximately 24-hour internal clock as they follow a day/night cycle (Kaiser, 1988).

Sauer et al. (2004) compared the behavior of sleep-deprived bees to bees that had experienced a normal amount of rest. To create conditions of sleep deprivation, they placed bees in a glass cylinder that was attached to a tilting device. The device titled every nine seconds in order to disrupt the bees and force them to stay awake for a period of 12 hours. The two ways they determined if a bee was sleeping were the amount of antennal immobility of the bee and the length of time between periods of antennal immobility. Trials were carried out in both light and dark conditions. Sauer et al. determined that after a bee experiences a night of sleep deprivation, the next night if it is left undisturbed, it will exhibit increased periods of antennal immobility compared to undisturbed bees. They had discovered that sleep deprivation in one night leads to enhanced sleep the following night, as the bee apparently attempts to compensate for its previously sleepless night. This sleep "rebound" is similar to how humans and other animals respond when they experience a deficit in the amount or the quality of sleep (Klein et al., 2010; Helfrich-Förster, 2018). The Sauer et al. paper laid the groundwork in understanding that sleep in bees is not simply for the purpose of conserving energy. If it were, bees would not have to make up for a night's lost sleep; they could simply eat additional food to acquire more energy. Their results indicate that sleep is regulated by physiological processes within the body that maintain normal body functioning (Sauer et al., 2004). This revelation suggests that sleep must affect other behavioural and physiological processes of bees, a topic we examine below.

Bees perform waggle dances to communicate information to their nestmates about the direction and distance to food sources (von Frisch, 1967). The goal of a study conducted by Klein et al. (2010) was to determine if sleep deprivation affected the bees' performance of waggle dances. In order to create conditions of sleep deprivation, this group of researchers disturbed forager bees by attaching metal tags to them, then placing them in an "insominator," a device that magnetically jostled the tagged bees for 12 hours. The bees' dancing and sleep behaviors were then observed for the 48 hours following the operation of the insominator. As a baseline for comparison, the waggle dances of both control and experimental bees were measured beforehand. This study established that when a bee was deprived of sleep, the precision of its waggle dances decreased. Specifically, it negatively affected the aspect of their dances that depicts direction; the angle of the bees' dances on the comb with respect to gravity became more ⇨



When a bee was deprived of sleep the precision of its waggle dances decreased. Specifically it negatively affected the aspect of their dances that depicts direction.

variable in the sleep-deprived bees. However, precision of the distance information, the duration of the dances, remained unchanged. Klein et al. (2010) hypothesized that conveying directional information is more physiologically or cognitively demanding than conveying information about distance. They concluded that it becomes more difficult for the bees to accurately perform their dances when they are sleep-deprived. These findings have broader significance, as decreased precision in waggle dances reduces the ability of dancing bees to direct their nestmates to food resources, which in turn decreases the foraging efficiency of their colony (Klein et al., 2010).

A study conducted by Beyaert et al., (2012) sought out to determine whether or not the consolidation of novel navigation memory in honey bees is dependent on sleep. The researchers trained a group of bees in a procedure termed a "forced navigation task," where the bees where trained to a feeder that was located 100 feet away from the hive. Upon the bees arriving at the feeder, they were caught and equipped with a tracking device. They were then transported to a release site that they had not previously visited, located 1970 feet away from the hive, and a different direction than the feeder. The bees were then tracked on their journey back to the hive. In order for the bees to successfully travel from the release site back to the hive, it requires two cognitive processes that encode novel learning: locating their position in their new surroundings, and retrieving memories from their initial flight. After the initial forced navigation task, the bees were then randomly chosen to be in either a sleep-deprived or control group. The experimental group of bees was placed in a vortex located outside of the nest and were gently shaken for eight hours during the night, in order to interfere with their sleep. The control was left undisturbed in the hive during this eight hour period. The next day, the bees were taken back to the release site and their journey back to the hive was recorded once again. The researchers found that the sleep-deprived bees experienced impairment in their consolidation of novel navigation memory. On the first trial 58% of the control bees made it back to the hive compared to 83% on the second trial, indicating that the bees had used newly consolidated navigational memory during the second trial of the experiment. The sleep-deprived bees performed equally in both trials. This demonstrated that bees need sleep to consolidate memories that they are forced to rely on the next day.

In an experiment performed by Hussaini et al., (2009) sleep deprivation conditions were created by placing bees on an instrument called a "vortex". The vortex shook the bee at 100-120 rpm every five minutes, for a period of 15 hours, in order to keep the bees awake. The bees were trained in a learning procedure known as "classical conditioning." In classical conditioning, a "conditioned stimulus," in this case an odour, is presented and rewarded with an unconditioned stimulus to which the bees normally respond, in this case sugar water. When

bees were presented with the sugar water immediately after being exposed to the odour, they learned to associate the two stimuli so that in subsequent trials they usually stretched out their tongues upon receiving the odor alone. After the bees were conditioned, the researchers then tested to see if there was a significant difference between extinction memory in sleep-deprived versus rested bees. Extinction memory is defined as the process in which a previously conditioned response (in this case, the extension of the tongue to the odour) is performed by the subject, without the being given the reward afterwards (in this case, the sugar water) (Hussaini et al., 2009). Therefore, a new memory is formed (Hussaini et al., 2009). The new memory is what happens when the conditioned stimulus (odour) is given in the absence of the reward (Hussaini et al., 2009). This process takes place as the subject learns to uncouple a response from the previously conditioned stimulus (Hussaini et al., 2009). After a series of experiments, the researchers discovered that the sleep-deprived bees had significantly reduced scores for extinction learning compared to rested bees (Hussaini et al., 2009). However, this phenomenon was not detected in trials that measured acquisition memory- the initial conditioning during which they learn to respond to the odor (Hussaini et al., 2009).

The general consensus today is that bees can become stressed by a variety of environmental sources, including parasites, pesticides and nutritional deficiencies resulting from modern agricultural methods (Goulson et al., 2015). One of the most negative consequences of stress is a lowered immune function, which contributes to bees being more susceptible to other stressors which, in turn, can lead to shortened bee longevity and colony population decline (Goulson et al., 2015). This can be dangerous as it may cause colony disruptions from which bees cannot recover. The research is clear that combined stress negatively impacts honey bees. Is it possible that disruption and deprivation of sleep contributes to the combined stresses weighing on bees? A specific situation where bees may experience sleep deprivation is during relocation. Every February in the United States, more than a million hives of bees are transported via trucks across the country to California for the purpose of almond pollination. Some colonies are moved five or more times per year to pollinate various crops and take advantage of honey flows. A study by Nelson and Jay (1989) found that when hives were transported 14 km (9 miles) to a new location, they experienced a 23% greater loss in colony population compared to colonies that were not moved (i.e., control hives). Bees in the colonies that were moved were also much more likely to drift from their new location (Nelson & Jay, 1989). Did loss of sleep contribute to this loss of bees after their hives were moved? Does the stress of sleep deprivation contribute to the reduction in the size of bees' brood-food glands that has been documented following their transport (Anh et al., 2012)? Does loss of sleep during long-distance transportation of colonies contribute to greater "oxidative stress" an internal imbalance that can damage cells and contribute to a reduction in immune function (Simone-Finstrom et al., 2016)? If loss of sleep contributes to a decline in immune function, does that help to explain why *Nosema* infections increase following hive movement (Zhu et al., 2014)?

Sleep-deprived bees experienced impairment in their consolidation of novel navigation memory.

In conclusion, sleep deprivation is detrimental to honey bees for a variety of reasons. There are many unanswered questions concerning the degree to which trucking hives from one place to another affects sleep and affects colony health. Further study of the consequences of sleep deprivation is likely to yield interesting links between colony health and beekeeping practices such as migratory beekeeping. BC

References

Anh, K., Xie, X., Riddle, J., Pettis, J., and Huang, Z. 2012. *Effects of long distance transportation on honey bee physiology*. Psyche. 2012: 1-9.

Beyaert, L, Greggers, U., and Menzel, R. 2012. *Honeybees consolodate navigation memory during sleep*. Journal of Experimental Biology 22: 3981-3988.

Helfrich-Förster, C. 2017. *Sleep in insects*. Annual Review of Entomology 63: 69-86. doi.org/10.1146/annurev-ento-020117-043201

Hussaini, S., Bogusch, L., Landgraf, T., and Menzel, B. 2009. *Sleep deprivation affects extinction but not acquisition memory in honeybees*. Learning and Memory. 16: 698-705.

Kaiser, W. 1988. *Busy bees need rest, too: behavioural and electromyographical sleep signs in honey bees*. Journal of Comparative Physiology.163: 565-584.

Kaiser, W., and Steiner-Kaiser, J. 1983. *Neuronal correlates of sleep, wakefulness and arousal in a diurnal insect*. Nature. 301: 707-709.

Klein, B., Klein, A., Wray, M., Mueller, U., and Seeley, T. 2010. *Sleep deprivation impairs precision of waggle dance signalling in honey bees*. Proceedings of the National Academy of Sciences of the United States of America. 107(52): 22705-22709.

Goulson, D., Nicholls, E., Botias, C., and Rotheray E. L. 2015. *Bee declines driven by combined stress from parasites, pesticides, and lack of flowers*. Science. 347(6229): 1-9.

Nelson, D.L., and Jay, S.C. 1989. *The effect of colony relocation on loss and disorientation of honey bees*. Apidologie. 20(3): 245-250.

Simone-Finstrom, M., Li-Byarlay, H., Huang, M., Strand, M., Rueppell, O., and Tarpy, D. 2016. *Migratory management and environmental conditions affect lifespan and oxidative stress in honey bees*. Scientific Reports. 6: 1-14.

Stefan, S., Hermann, E., and Kaiser, W. 2004. *Sleep deprivation in honey bees*. Journal of Sleep Research. 13(2): 145-152.

von Frisch, K. 1967. *The dance language and orientation of bees*. Cambridge: The Belknap Press of Harvard University Press

Zhu, X., Zhou, S., and Huang, Z. 2014. *Transportation and pollination service increase abundance and prevalence of Nosema cerane in honey bees* (Apis mellifera). Journal of Apiculture Research. 53(4): 469-471.

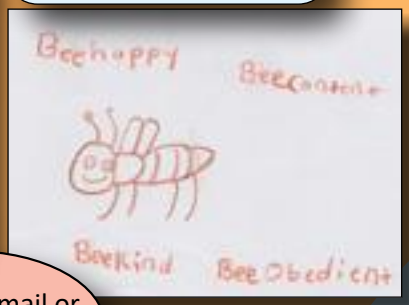
All The Buzzz in...

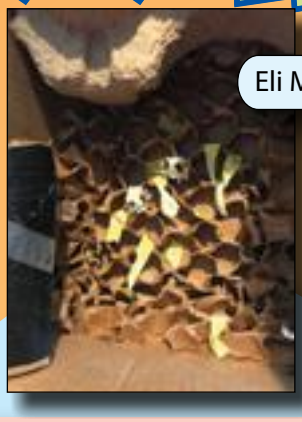
Hello Friends,
May you wade creeks, make flower chains, and spend many hours barefoot this summer!
Bee B.Queen

Bee B. Queen Challenge

Please snail mail or or e-mail your artwork!

Mary Beth Byler, 16, OH





Eli Mau, 15, MN

Eli create this diorama of the inside of a bee hive.

The Mighty Mandibles

The honey bee has two types of mouth parts – the proboscis and the mandibles. The proboscis is mainly used for sucking up nectar, water and honey. The bees also exchange food with each other using their proboscises.

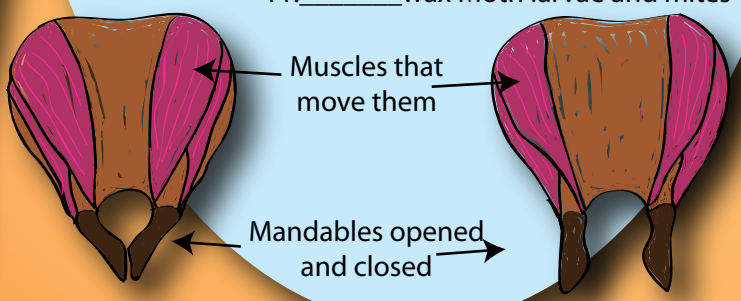
The mandibles are the strong and useful jaws of the bee consisting of two parts that can open and close. The mandibles of a honey bee are like a tool. They can cut, squeeze, or grasp. Learn more about the many ways honey bees use their mandibles. Match the action word of the mandibles with the hive task.

Mandables

Honey bees use their mandibles to….

Move
Cut
Carry
Remove
Work
Tear
Bite
Form
Attack
Clean
Protect

1._____ dead bees out of their hive
2. _____ out of the brood cell
3. _____ wax scales into honeycomb
4._____ down unused queen cells
5._____ wax from one area of the hive to another
6. _____ propolis into hive cracks and crevices
7. _____ the proboscis
8._____ debris from the hive
9._____ other bees
10._____intruders
11._____wax moth larvae and mites



Human "Mandibles"

You will need:

- red apple
- nut butter
- marshmallows

Directions:

1. Have an adult use a sharp knife to slice the apple into pieces less than an inch wide.
2. Spread nut butter on one side of an apple slice. You will need two slices.
3. Line up marshmallows on top of the nut butter on one apple slice.
4. Place the other apple slice on top of the marshmallows with the nut butter side down.
5. Sink your teeth into these tasty teeth tidbits.

1 carry, 2 cut, 3 form, 4 tear, 5 move, 6 work, 7 protect, 8 remove, 9 clean, 10 attack, 11 bite

... Bee kid's corner

Produced by Kim Lehman -www.kim.lehman.com
www.beeculture.com
June 2018

Celebrate Pollinators!

How are you going to celebrate National Pollinator Week June 18-24?

Maybe you could…
- Host a pollinator-themed snack
- Invite your friends over for a honey tasting
- Build native bee houses
- Make seed balls using seeds for pollinator plants
- Join the Million Pollinator Garden Challenge

Register your event at http://pollinator.org/pollinator-week and inspire other to join in!

Bee Buddy

Charlotte Crowe, age 10 from South Carolina, loves 4-H. When the local 4-H offered "The Pollinators and Honeybee Project", Charlotte and her family found a local beekeeping mentor, Mrs. Sue Suber. Sue had just the right amount of grandmother, scientist, and bee skill to make any youth excited to learn about beekeeping.

This year the family will be getting their own bees. Charlotte has already assembled and decorated the hive. She is very "ner-sited." That's Charlotte's word for nervous and excited, nervous because it's their first hive and excited because it's a fun thing helping honey bees.

Charlotte has been recogonized for her work. She won the poster contest at the county fair with her Informative Beekeeping poster. Her beekeeping record book for 4-H was excellent and she was awarded an entomology pin. She was also the runner up for the Miss South Carolina 4-H Pageant having worn a white outfit with hand sewn flowers and bees as her "project wear".

Happy beekeeping Charlotte!

Mandible Muscles

The jaws of a honey bee are made up of two mouth sections that are attached to powerful muscles allowing the parts to come together to grasp objects. These muscles are the second strongest muscles in a bee. What do you think are the bee's strongest muscles? If you said the muscles that move the wings, you are right! Use your body parts to grasp objects and test the strength of the different muscles.

1. Cut a 3-inch piece of a swim noodle using a serrated knife.
2. Hold the foam between your pointer finger and thumb. Squeeze together. Notice the hole inside the noodle section. Were you able to pinch the sides enough to close the hole?
3. Try using your thumb and each finger separately. Which finger muscles are the weakest? The strongest?
4. Now try squeezing the foam between your elbows, knees, , and feet to discover stronger and weaker muscles in your body.

Beecome a Bee Buddy

Send two self addressed stamped envelopes and the following information to: Bee Buddies, PO Box 2743, Austin, TX 78768.

Name
Address
Age
Birthday Month
E-mail (optional)

We will send you a membership card, a prize and a birthday surprise!

Send all questions, photos and artwork to: beebuddiesclub@gmail.com or mail to the above address.

Summer Management

In The Southeast U.S.

David **MacFawn**

Summer management in the southeast, such as South Carolina, usually starts in June and continues through September. By the end of May, and no later than the first week of June, the Spring nectar flow is over with most hobbyist beekeepers preparing for a Summer dearth lasting from mid-June through mid-August. Beekeepers located close to a planted crop such as cotton or soybeans get some nectar flows in late Summer.

During the transition into Summer the queen begins reducing her egg laying while *Varroa* mites continue to increase in population. With the reduction in egg laying, there is less brood for the mites to reproduce in resulting in a higher percent of capped brood containing mites. Additionally, more mites are on the bees (phoretic mites) during this time. Now is the time to do a mite count (alcohol wash, etc.) and treat if necessary. I normally treat for *Varroa* sometimes between the middle to the end of May in South Carolina with Thymol which allows splitting the colonies mid-June. The beekeeper should continually monitor their mite levels throughout the year. Honey supers should have been removed prior to treating. With the end of the major nectar flow no later than the first week of June, any remaining incoming nectar from the Spring flow will be stored in the food and brood chambers thus not presenting an issue tainting honey for human consumption.

The number of bees in colonies remains high in mid-June. Adequate drones and good weather is suitable for making increases. I split my colonies and marry the split with a mated local queen. Whenever mated queens are available, I use mated queens rather than doing a walk-away split where you let the bees raise their own queen from young larvae. Using mated queens supports the split by minimally interrupting the population age dynamics and gives them adequate time to build a healthy population before the Fall nectar flow and Winter. I feed sugar syrup (1:1) when making these Summer splits to provide the one thing nature has taken away – liquid carbohydrates. This ensures the splits have enough food. Feeding pollen substitute should also be considered as some areas have pollen dearth's as well during late Summer.

Splitting in June is easy and usually very successful. Splitting during this time frame will help build your colony numbers and offset losses due to *Varroa* and other maladies. Using drawn comb is greatly preferred as it is sometimes difficult to stimulate wax production and comb building by increased syrup feeding alone during a dearth. Feeding the split 1:1 sugar syrup is recommended as is pollen substitute. Dry pollen substitute in containers on their sides such that water cannot get in is recommended. Small Hive Beetle populations can be high this time of year and often multiply when pollen patties are used unless the patties are very small and placed directly above the brood nest.

Splits should be made no later than August and married with a mated queen (local if available). In my area mated queens are typically available until August and often their prices may be dropping. Splitting in August will allow time for the split to build-up prior to Winter. It takes about a week or so for a mated queen to really start laying and another three weeks for her first workers to emerge. So, that puts workers emerging from the new queen in mid-September to first of October. This will allow about another month, until October, for the colony to build-up provided the beekeeper provides supportive measures.

Splitting during the Summer, after the nectar flow, should be considered regardless of future intensions to split the following March in the Southeast. The rationale is when you split in March, mated queens are typically difficult to obtain and you have to do a walk-away split which impacts your honey yield that year whereas splits done after the nectar flow the previous year come into Spring building and ready for production of bees and honey.

When feeding sugar syrup in the southeast in the Summer, the syrup should be checked at least weekly for fermentation. Syrup fermentation is an issue with the high temperatures during the day and night. Any colony

that goes "off their feed" should be investigated for issues with the feed or the colony.

When removing Spring honey, the beekeeper needs to decide how much Spring honey to leave on the colony. In most parts of the Southeast, there is a Summer dearth which means the beekeeper needs to decide whether to leave Spring honey on the colony or feed 1:1 sugar syrup. Another consideration is that in many parts of the southeast the Autumn nectar flow from Aster and Goldenrod is weak and cannot be relied on for any meaningful colony stores. This means when pulling Spring honey, the beekeeper needs to plan for a Summer dearth through the Autumn and Winter when considering long term colony Winter stores.

If the beekeeper can catch a planted crop during the Summer, such as cotton or soybean, it will assist in honey yield, building up the splits, and ensuring the colonies have enough stores to get them through the Winter. Cotton and soybean does not yield nectar in all locations depending on the weather, soil, and plant variety. However, often even if the crop does not yield nectar, there is a pollen flow from the crop, allowing the colonies to build up if supplemented with 1:1 sugar syrup to replace a negligible nectar flow.

Mid-Summer is the time to consider crop pollination. This will bring in much needed revenue. The beekeeper may have to move their hives to pollinate crops or catch another nectar flow. If you are a honey producer, travelling to a mid-Summer nectar flow such as sourwood, cotton, or soybean can be beneficial. You will need to analyze if the quantity of nectar from the flow and reliability of the flow is financially worth moving the colonies. In addition, the beekeeper needs to determine if any pollination rental fees will cover moving costs and provide a reasonable profit. An agreement needs to be made with the farmer to notify of pesticide, fungicide, or other sprayings. Finally, depending on the crop, such as cucurbits, the bees may have to be fed since the colonies may lose weight. This necessitates another yard visit, with trip expenses as well as feed costs being included in the pollination fees.

Varroa mite numbers should be checked early in August when the Winter nurse bees are beginning to emerge in addition to throughout the year. If high, the colonies should be treated. "Mite bombs" from dead-outs and other colonies should also be considered when counting *Varroa* mite numbers. It normally takes two to three months for a colony to succumb to *Varroa* mites if not treated in the Summer and Autumn. This means if the colonies are treated in June, they should be checked again in August and also in October or November.

Wax Moths

For Wax Moths, temperatures between 5°C (41°F) and 18°C (64.4°F) results in no developmental activity. Wax Moth eggs are not able to hatch at temperatures below 18°C (64.4°F)[1] Hence, when the temperature cools to below about 64°F, the beekeeper has less worries about Wax Moth damage. Below 41°F (5°C) wax moth larvae are completely dormant.

This means wax moths are an issue in most of the southeast during the Summer. Your best defense against wax moths is a strong colony. A strong colony can be defined as a colony strong enough to defend the volume of its hive. For some colonies that may mean multiple 10-frame Langstroth hive bodies; for weaker colonies it might mean a five-frame nucleus hive with a one bee space entrance reducer. The beekeeper should be mindful of matching colony population to the appropriate amount of hive space they must defend.

Beekeepers need to be mindful to protect the comb acquired from colony dead-outs if at all possible. The combs can be frozen or let light and air access the frames

which inhibits wax moth development. Another option is use of paradichlorobenzene if you plan on stacking or storing hive bodies of drawn comb. If the comb is left in a closed hive, wax moth damage will occur especially on the dark comb where brood has been raised resulting in the loss of the bees' legacy and the beekeeper's greatest asset – drawn comb.

Small Hive Beetles (SHB)

Small Hive beetles can become an issue. Like wax moths, a strong colony is the best defense for small hive beetles. If the colony has more than 15 to 20 small hive beetles, then a beetle trap (Cutt's beetle blaster) or dry, unscented "swiffer" pads may be appropriate. If "swiffer" pads are used, be careful if you have a lot of propolis on the inner cover. The pads are normally placed between the top box and the inner cover. If there is a lot of propolis on the bottom of the inner cover or on top of the super frames the pads will stick to the inner cover resulting in the inner cover being difficult to remove. Small Hive Beetles will normally get their legs tangled in the fibrous pad while the bees will not. If the colonies are moved often, Small Hive Beetles are less of an issue since when they pupate in the soil they will not re-infest the colony.

Colonies in full sun, especially in the morning through mid-afternoon, may also inhibit SHBs.

Summer management in the southeast takes some planning. Usually it takes more than the Spring nectar flow to be profitable unless you simply wish to have a couple of hives in your backyard. Either selling nucleus hives in the spring or another flow or pollination is necessary. After the Spring nectar flow is over, and the colonies are split, a decision needs to be made if you are going to catch another nectar flow or secure pollination contracts. The cost and revenue numbers need to be analyzed to determine if another flow or pollination is profitable and deciding on the best way to proceed. BC

[1]State of New South Wales through NSW Department of Primary Industries 2007; **http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0010/176284/wax-moth.pdf**

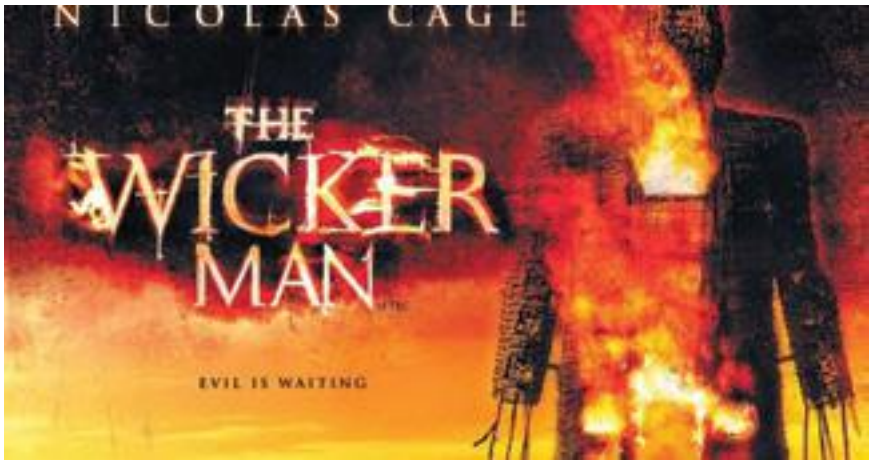
Victoria, Department of Environment and Primary Industries, "Wax Moth - A Pest of Combs and Honey Bee Products". *agriculture.vic.gov.au. Retrieved 2017-04-26.*

The Wicker Man

The Eye Of The Beholder

Ryan **McDearmont**

For better or worse, Nicolas Cage is one of American cinema's most enduring icons. The now 54-year-old actor has starred in dozens of films since his debut in 1982, all of scattershot quality. Every award-winning Cage outing mirrors a less successful counterpart: for every *Leaving Las Vegas* (1995), there's a *Deadfall* (1993); for every *National Treasure* (2004), a *Next* (2007). This constantly shifting balance of excellence and failure within Cage's work has carved an uneven filmography to say the least, but one nonetheless packed with a certain type of gem. Looking beyond the binary of "flops" and "successes," one can find no end of Nicolas Cage films which combine the good, the bad, and the ugly to become unstoppable, unforgettable movie-going experiences.



These are the movies such as *Con Air* (1997), a relatively solid prison-heist film which can be enjoyed twofold: for its intense, over-the-top action, but also for the hilarious, unbelievable performance Cage delivers as protagonist Cameron Poe. In every scene, Cage milks his hammy, Southern-accented, mullet-sporting persona down to the last drop. It doesn't matter how funny it is when he steps off a prison bus and his unwashed hair flows luxuriously in the wind – Nicolas Cage believes in his characters over a hundred percent, and he expects the audience to buy in too. This absolute commitment and unwavering devotion to a part is both Cage's greatest strength and greatest weakness as an actor: no matter how terrible the role, he gives it his all.

When the method works, he's subsumed by his character entirely: see his mind-bending and restless turn as twin brothers in *Adaptation* (2002). When it fails, however, audiences are left at the mercy of Nicolas Cage desperately over-acting as some of the worst characters ever put to the silver screen. This prolonged lack of self-awareness can either come across as hilarious, such as his incredible, big-city bug-out in *Vampire's Kiss* (1989), or deeply embarrassing, as in the majority of his films made after 2011. The best of his worst, however, manages to combine the two extremes into an uneasy, outlandish stew – something so beyond the realm of traditionally good acting you can't help but laugh, but so inconceivable you wonder what in the world Cage was thinking. This brings us to his ill-fated remake of a horror classic: *The Wicker Man* (2006). Of course, this brings us to the bees as well.

Oh yes. The bees. The bees, the bees, the bees. Picking up on what's now one of the most infamous bee-related film sequences of all time, the internet quickly harvested *The Wicker Man* as fodder for endless memes and video gags in the 12 years since release. Anyone who's watched an "Ultimate Bad Acting Compilation," or perhaps a "Nicolas Cage Best Moments!" video on YouTube will surely recognize the scene: hundreds of agitated honey bees pour onto Cage's face as he screams like a banshee and writhes as if electrocuted. "Not the bees!" he proclaims, jerking his head to shake off the invading insects. His intense movements and exclamations are answered only by the comically stony-faced onlookers, a set of actors and extras privileged enough to experience one of the greatest film freak-outs of all time. Carried by Cage's absurd energy, the scene is monumental in both stupidity and unintentional hilarity – but I'm getting ahead of myself.

This iconic moment of trash cinema doesn't arrive until the conclusion of the film's "Unrated Cut," and *The Wicker Man* offers many takes on bees well before then. While abundant in Cage's telling of the tale, the honey bee and hive iconography are completely absent from the original version of *The Wicker Man* (1974). Those versed in British cinema, or horror films in general, might know this first *The Wicker Man* as an unsettling masterpiece of what some call "folk horror": movies focusing on the terrors of rural cults and witchcraft, spearheaded by films

such as *Witchfinder General* (1968) and *The Blood on Satan's Claw* (1971).

Almost a uniquely European phenomenon, these dark, yet refined yarns of village paranoia found a lasting champion in *The Wicker Man*. The poisonous parable pits straight-laced Sergeant Howie against Pagan cultist Lord Summerisle (played by the legendary Christopher Lee), as Howie attempts to locate a missing child on the distant Summerisle island. The strange locals are uncooperative at best, and outright antagonistic at worst. Strange rituals and whispers of human sacrifice abound, the strings tighten, and soon Howie finds himself in a situation which he cannot escape. The film's ending, both brutal and beautiful, speaks to cosmic dread and human terror alike – Howie's (spoilers!) sacrificial death by burning within a giant wicker effigy of a man is a terse footnote on an already harrowing experience.

Above all, the 1973 version of *The Wicker Man* is a well-measured film, both subtle and shocking in equal quantities. These days, it's well-regarded by cast, critics, and audiences alike, with Christopher Lee in particular citing the movie as his best performance. It's unfortunate, then, that the 2006 remake failed to retain any of the chills or intrigue which molded the original film into such a singular experience. If not for Nicolas Cage's singular display, our modern *The Wicker Man* might have been overlooked as yet another misguided remake seeking to capitalize on the chills of yesteryear. However, it's Cage's effort, and the inclusion of bees and bee aesthetics, which make the lesser version memorable; albeit for many of the wrong reasons.

The broad strokes of 2006's *The Wicker Man* are by and large the same. Cage, as policeman Edward Malus, visits the matriarchal neo-pagan colony Summerisle to locate his ex-fiancée's daughter. Lorded over by Lady Summerisle, the suspicious inhabitants once again impede Malus' investigation, before entrapping him as in the original film. Much like Howie, Malus meets his end roasting inside the eponymous wicker man. Those who have seen or read about one of the versions will largely understand both, so there's not much use in a point-for-point recap. The biggest change in the 2006 edition, however, is the addition and use of honeybees as a theme throughout. In this version of Summerisle, selling honey is the colony's connection to the outer world, and it's this trade which drives the events of the film.

While Howie's demise in 1973 is brought about as a simple appeasement of Pagan deities, Malus' eventual end in 2006 is a more business-minded move. The film establishes that honey harvests have dwindled, with Malus' sacrifice intended to reinvigorate the waning crop. This seems to be a way to skirt some of the more explicit content of the original film, as the shocking elements of 1973 are replaced by the aesthetics of the hive, made sinister only by context and cinematography. The effect of this "safe" replacement for nudity and other such graphic content are twofold: from a visual standpoint, *The Wicker Man* is, strangely, at its best when focusing on the honey bee. However, by doing so, it also becomes one of the few "beesploitation" films to explicitly cast shadow on the beekeeper, as opposed to just the bee.

In terms of design, *The Wicker Man* largely succeeds. The village on Summerisle is a picturesque representation of American colonial architecture, and even when the beauty is interrupted by Nicolas Cage, the sets are one element the film gets right. Their outward, scenic appearance is twisted by the lens of the hive: within these houses, yellow and amber hexagons evoke the toil of the drone, thus drawing connections between the cult mindset of the locals and the work ethic of the bee. While this is an interesting conceit, *The Wicker Man* unfortunately never engages with analysis of the beehive beyond the most surface-level representation.

These aesthetic choices, made vaguely ominous, are reflected and multiplied throughout. In one sequence, Cage stumbles through a field of hives, under attack by the apiary's occupants. As he stumbles, the camera cuts: these hives are in a field of hexagon paths, shorn mathematically through the grass by toiling hands. It's a continued, respectable commitment to a singular visual motif; an obsession with the hive on a level rarely reached by other films. Most interesting, however, is the display of pre-modern "skeps," open-ended wicker and mud baskets placed upside down to house bees. Such classical beekeeping equipment is rarely seen in fictional films, so it's by no means an unwelcome choice. Even more compelling are the classical, rounded, woven-insert hoods worn by keepers of *The Wicker Man's* bees.

If you have an eye for art, you might recognize these antique suits from classical pieces such as Pieter Bruegel's painting, "The Beekeepers and The Birdnester." Others will know Bruegel's iconic image as the cover art of *White2,* a monolithic, malefic metal album by musicians Sunn O))). In most contexts, the face masks are striking, unique, and yes, a little bit creepy. Although it's clear *The Wicker Man* uses these hoods for their unsettling nature above all else, the movie interacts with a rich history of beekeeping, whether intentionally or not. It's easy to wish that the entire film focused on these historical artifacts; that we could spend an hour and 40 minutes in the world of these fascinating visuals and archaic vestments of apiculture, but this is not the case. These irresistible museum pieces are relegated to the background, and instead Cage's histrionics are placed front and center.

This is a boon for those who thrive on unintentional comedy, but less so for those who find themselves engaged in the world and texture of *The Wicker Man*. Even worse, perhaps, is the implicit condemnation of apiculture leveled by the film. Despite the alluring design, beekeepers are indeed presented as some manner of ominous being, their humanity sealed behind a mask. As the entire town works to sacrifice officer Malus in preparations for a harvest, the bees turn from a background element to yet another force of fear. The rural nature of Summerisle calls to mind primal anxieties repressed by those in more urban areas, with the seemingly "rustic" practice of beekeeping only accentuating the strange nature of the town's inhabitants.

It's an attitude prevalent in no end of "beesploitation" films, and while *The Wicker Man* might pay homage to the lineage of beekeeping, it does little to approach it in any meaningful or positive way. The work of the bees once again becomes an

analogue for the psyche of a cult, and an innocent facet of nature is turned to a sinister darkness. To *The Wicker Man*'s credit, however, it realizes that bee stings would not be lethal, or even damaging to the average person – thus the film makes sure to point out that officer Malus is deathly allergic to bees. This particular footnote might have lent some tension to the film, if only Cage hadn't hammed it up more than Porky Pig.

Even if its approach to apiculture had been more nuanced, and the compelling tastes of beekeeping expanded, *The Wicker Man* would still be an utter failure from every angle. The narrative is flimsy, and the pacing almost too boring to tolerate. Propelled out of obscurity solely by the unrestrained power of Nicolas Cage, *The Wicker Man* has little to offer those who don't enjoy a helping of unintentional comedy. You'll chuckle in disbelief at the aforementioned bee scene, crack up when Cage punches someone while dressed as a bear, and have some laughs when he steals a schoolteacher's bike, but there's not much that could be considered an effective horror film. Is it a shame? Probably not. When it comes to *The Wicker Man*, the 1973 version is hard, if not impossible to beat. There's no way a quick remake would recapture that magic, so we might as well have some laughs while we're at it. Much like Nicolas Cage himself, there'll never be another like it. BC

Beeyard Thoughts, Observations, and Updates

Flower gardening discussion and issues for the beekeeping non-gardener – that would include me, too.

My two bee worlds

I can already tell that this is going to be one of *those* articles. I have written three or four introductions and all are now wadded in my electronic trashcan. Essentially, this is what I want to discuss with you but I am not sure how to open. *I want to put in wild flower plantings on my acre but I am not sure what I am doing.*

I promise you that what follows is true – at this very moment, my neighbor is cutting his grass for the first cut of the season. The sound of a mower – somewhere near me – will go on until next November just before Thanksgiving. The 2018 mowing season is officially here in Wooster, Ohio.

As is true for all areas that have lawns, the technology for grass cutting has blossomed from the 22" Briggs & Stratton, 3 HP push-mower that I used in my youthful grass-cutting business. Like everyone else, I now climb upon my riding mower with hydraulics and power steering and hydraulic-assisted brakes and off I do go to beautify my lawn.

To run these machines, large expanses of open lawn – with few trees – is ideal. If you have read my myriad past articles on this lawn subject, you are painfully aware of my fixation on this lawn maintenance subject.

So what does mowing have to do with pollinator gardens?

All this standardized mowing that goes on in my manicured cul-de-sac community does not fit particularly well with raised pollinator gardens or flowering gardens that are anything but in full bloom. Those of you who do not live near other people who constantly care for their lawns and who do not have my irrational passion for bees may be hard pressed to understand my thread here. I don't want to be *"that guy"* in the neighborhood who stands out, but I do want something besides a grass lawn.

If I may, could I break this topic into subject areas and discuss them individually? Otherwise, I sense that I will ramble to the point of oblivion – something I can do very well.

1. *I want the flowering garden look that many of you already have.*

I love flower garden photos of those backyards that have gravel paths with cast iron benches punctuated with bird waterers and bird boxes – and flowers and plants everywhere.

Presently, I have heavy Ohio soil that sticks to my boots until about the middle of June. I have crabgrass/cool season perennial fescue lawn mixed with white clover that I do not spray. It's hardy ground cover on which my grandkids can romp and we can take tractor rides that leave lawn marks – but I don't care. This scruffy back lawn is for play. But this is not the image of my perfect world. It's too real – too practical – too sterile. How can I punctuate with flowers?

2. *I simply cannot take on another major time/work commitment.*

Whatever I do to develop flower plantings needs to be easy to do and not require significant amounts of reading time and work time. Additionally, it cannot require a meaningful amount of maintenance time. I hypothesize that easy lawn maintenance is why so many of us value manicured lawns. Get on the mower and go. I admit that I am presently very nearly within that group.

As do all of you who have read to this point, I have other aspects of life that compete for my waning energy. Writing this article, finding photos, developing ancillary electronic social media files and then editing everything will take about two days. And that's just this article. There is always something that needs to be done. But I have no lock on this *time* excuse. We all could readily use more time. But I need to candidly say that if this flower garden project becomes too large, too demanding – I will fail. Right now, I struggle to keep my bee colonies going.

Still attractive to pollinators but beginning to decline.

3. *I've already tried this pollinator garden concept a few years ago.*

I didn't just come to town on a turnip truck. Several years ago, I bought seed and converted my small vegetable garden to a flowering garden. It was initially easy to do. I tilled as usual and shallowly strew a bee mix of flower seed suitable for Ohio.

As should be expected, all was bare ground for several weeks. In the bare, exposed soil, robin's found the worm hunting to be very good. Rabbits sampled some of the young plants as they emerged. Ground hogs began to compete with the rabbits, but even with all of this salad consumption, the plants grew and prospered reasonably well. They flowered beautifully and the pollinators came as well as the Japanese beetles, stinkbugs and an assortment of other uninvited insects. Neighborly compliments flowed.

4. *Then came the midsummer decline*

By hot, midsummer some of these plants were giving it up. I was expecting this. Annual plants that were finishing seemed to start yellowing/browning from the bottom. The spent flowers needed deadheading. That's not going to happen. There was a selection process whereby those plants that bloomed longer tried to sally on but the beautiful first flush was over. As Summer progressed, all became a brown jumble of dead/dying plants and encroaching weeds punctuated with a few desperate flowers. All the compliments stopped.

Ohio Prairie Nursery

JAMES TEW

Eastern Great Lakes Pollinator Mix Lot 364296

Botanical Name	Common Name	% of Blend	% Germ	Test Date
Schizachyrium scoparium	Little Bluestem	24.31%	96.00%	6/30/2017
Bouteloua curtipendula	Side-oats Grama	13.56%	95.00%	9/6/2017
Elymus riparius	Riverbank Wild Rye	10.75%	96.00%	3/31/2018
Elymus virginicus	Virginia Wild Rye	7.50%	99.00%	8/31/2017
Elymus canadensis	Nodding Wild Rye	6.25%	96.00%	9/26/2017
Echinacea purpurea	Purple Coneflower	5.00%	95.00%	11/9/2017
Coreopsis lanceolata	Lanceleaf Coreopsis	4.25%	93.00%	8/30/2017
Gaillardia pulchella	Indian Blanket	3.12%	94.00%	11/27/2017
Orbexilum pedunculatum	Sampson's Snakeroot	3.12%	92.00%	2/9/2018
Asclepias syriaca	Common Milkweed	2.50%	93.00%	2/12/2018
Dalea purpurea	Purple Prairie Clover	2.50%	95.00%	12/6/2017
Monarda citriodora	Lemon Mint	2.50%	81.00%	2/9/2018
Zizia aurea	Golden Alexanders	2.50%	90.00%	2/12/2018
Tradescantia ohiensis	Ohio Spiderwort	2.19%	92.00%	2/8/2018
Vernonia altissima	Tall Ironweed	1.88%	89.00%	12/6/2017
Liatris spicata	Dense Blazingstar	1.50%	86.00%	2/8/2018
Asclepias tuberosa	Butterfly Weed	1.25%	91.00%	2/12/2018
Baptisia alba (macrophylla)	White Wild Indigo	1.13%	91.00%	11/30/2017
Silphium terebinthinaceum	Prairie Dock	1.13%	99.00%	3/14/2018
Dalea candida	White Prairie Clover	0.94%	76.00%	2/9/2018
Monarda fistulosa	Wild Bergamot	0.94%	97.00%	11/2/2017
Rudbeckia hirta	Black-eyed Susan	0.94%	95.00%	9/16/2017
Aster laevis	Smooth Aster	0.06%	99.00%	2/5/2018
Aster novae-angliae	New England Aster	0.06%	99.00%	1/30/2018
Ratibida pinnata	Yellow Coneflower/Grey-Headed Coneflower	0.06%	99.00%	12/22/2017
Solidago rigida	Stiff Goldenrod	0.06%	89.00%	2/8/2018

Pure Seed	Other	Inert	Weed	Total
92.70%	0.04%	7.26%	0.00%	100%

1.44 NET POUNDS

Ohio Prairie Nursery - PO BOX 174 Hiram, OH 44234 330.569.3380
www.OhioPrairieNursery.com

Should I have mowed those spent plants and planted Fall season blooming plants? Will these plants perpetuate themselves or need a boost of newly applied seeds next season? Or should I have just completely replanted?

5. *I'm doing that thing I do*

I'm unintentionally doing that thing I do – where I make things look too negative. Obviously flowering gardens are beautiful, and if in large quantity, highly beneficial to pollinators and attractive insects. I (and you) will need to expect other uninvited species to visit the plantings.

I will need to become more acceptant of a periodic scruffy look that such planting will – of necessity – exhibit. If I committed more time to the plantings, I could keep them looking nicer, but I would have to spend that time at the expense of other of life's projects. My advice to myself is: do not start too large and while doing the best I can, do not expect perfection.

6. *This is the mix that I have purchased (see the list).*

The price of the seeds is not inconsequential. For me, the price of the seed would require that I put in enough time and effort to make this project a bit worthwhile.

7. *Finally, for those with experience, could you offer suggestions?*

In summary, I am a beekeeper who would like more wildflowers in my area. I mean I like a diversified ecosystem; I like colorful flowers for my enjoyment and for my insect pollinators. But make no mistake – I am not presenting myself as an accomplished gardener. If some of you readers have had a degree of success with pollinator-supporting gardening, send your comments along. I expect that your advice would be helpful to those of us who are beekeepers that like flowers.

If this project works at all...

If this project works – at all – I will keep you informed with a few monthly comments and photos. If this project does not work – at all – I probably will not say much more about it.

A related flowering topic that I should mention

Exotic and invasive plants

Beekeepers have a notorious reputation for propagating undesirable plants. *(...and immediately, the arguments start....)* An undesirable plant is perfectly fine to one, but abhorrent to another.

Of the many flowering plants in this category, I have selected the Mimosa (*Albizia julibrissin*) simply because I grew up with it. Indeed, Mimosa (Silktree) has been in this country for 250 years. Butterflies and other pollinators like it[1]. To some this small tree is an invader that should not be propagated while others love the plant. *It's either an "invasive exotic species" or a "treasured garden heirloom" depending on one's point of view.*[2]

Can you believe this? About 58 years ago, some kind of viral blight came through my hometown area that killed Mimosas. Wounds would open on the tree trunk that

[1]For honey bee foragers on mimosa, see: https://www.youtube.com/watch?v=zftCQA4O2g8

[2]https://davesgarden.com/guides/articles/view/254/

would ooze white, frothy sap that attracted wasps. Far and wide, people were decrying the mass die-off of what later became an undesirable invasive. Several fully grown mimosa trees (trees that were easy to climb and produced soft flowers that served no particular purpose other than producing a very pleasant odor.) As the years passed, the tree came back. Bees would visit it, but it was not a major food source for them. So why write all of this?

I have pleasant memories of an invasive plant. I am always surprised when I learn that concerned plant specialists have listed a beloved plant as obnoxious. The sweet clovers are an example of unloved plants by some while beekeepers tend to love the plant and the high quality honey it produces.

To some authoritative sources, *Sericea lespedeza*[3] is a pasture, hay, and conservation plant. Yet to other authoritative sources, *Sericea* in an invasive and should be eliminated[4]. Honey bees visit the flowers of this plants, but it is not a particularly great source, however, it is a dependable source.

Beekeepers beware...

Chinese tallow tree, purple loosestrife . . . the *"bad plant"* list goes on and on. It is a conundrum for beekeepers that bad plants are so frequently good for bees. For instance, there are quiet verbal reports of native bees prospering on bad plants growing in the western U.S. Of course honey bees do this all the time. If beekeepers who have a flowering interest wander from "approved" flower lists, it will not be difficult to step on some opinions of people who have different views. For instance, Purple Loosestrife seed can be purchased on the Internet specifically for beekeepers or for landscapers looking for plants with Fall color.

No doubt, I will get some correspondence concerning my brief discussion here. I do not propagate – in any way – any plant that is clearly known to be invasive. But it should be no surprise that my bees will not have the same opinion.

[3]http://www.aces.edu/pubs/docs/A/ANR-1318/ANR-1318.pdf
[4]http://www.aces.edu/pubs/docs/A/ANR-1318/ANR-1318.pdf

Can this simple topic be any more confusing?

Some plants seriously do not want bees to pollinate them. The evidence is frequently weak, but the accusations have persisted over great periods of time.

Yellow Jasmine (*Gelsemium sempervirens* – most likely)

Alabama regulatory specialists reported what is apparently the first occurrence in a very long time, but Yellow Jasmine nectar *apparently* killed some colonies in Alabama this past Spring. There was profuse bloom of Jasmine across the state and a few documented cases where colonies were completely killed leaving behind pesticide-like symptoms. But at that time of the season, pesticides were not being applied in large quantities and little else was in bloom. The reports of actual colony deaths were not great. It should be noted that colony deaths were not in the same area of the state. There is no estimation of how many colonies were damaged but not killed. The situation – if there even was one – has now cleared.

If this was Yellow Jasmine poisoning, it is a rare event. This has not been documented in anyone's living memory in Alabama. The evidence is all circumstantial, but there was not a good second option.

Azaleas

Like Yellow Jasmine discussed above, azaleas are historically labeled as plants that produce nectar that is toxic to bees. Mountain Laurel is another plant that is considered to be unhealthy for honey bees.

The challenge here is not that beekeepers actively plant azaleas for bees, but that in some areas of the U.S., azaleas are common plants occurring over vast areas. The web is filled with reports that honey bees do not visit, but just like my relationship with Mimosa above, I have routinely seen honey bees in azalea blooms. (I have no earthly idea what the variety was.)

So – there's excitement in the pollinator gardening world

There's good bee plants. There's marginal bee plants. There's good plants in the wrong place. There are bad plants in the right place. There are bad plants that are bad to bees. And everywhere there are people with opinions.

I need to say one more time – I am not a flower gardener. I'm a bee guy with a related interest in flowers. I'm interested doing something, but at this very moment, I am not sure what that will be.

Maybe a mini garden would fulfill my gardening interest.

Thanks for reading. If this project flowers, I will keep you informed. BC

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

1. Bee foragers on Mimosa

2. URL citation for comments for two opposing mimosa opinions

Old photo converted from 35mm slide film. Deep super is upturned with repurposed inner cover tacked to the bottom. The plants are containerized. The flower box is attached to the stump.

3. URL citation in support of *Sericea lespedeza* as a beneficial plant

4. URL citation not in support of *Sericea lespedeza* as a beneficial plant

BIGGER PICTURE

Jessica **Louque**

Bird Collecting – Ducklings of Spring

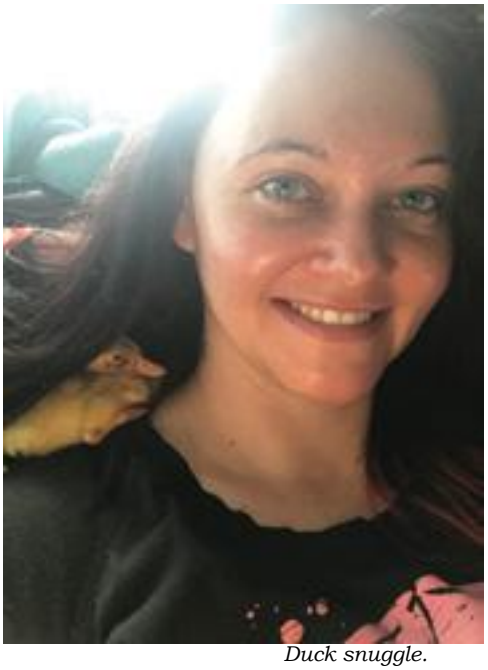
Usually around this time of year, I have an article or two that centers around new birds. I've had a lot on the turkeys in the past year or so, but this Spring, we branched out a bit on a whim. I have a friend, Taylor, who does photography and had a bunch of Spring sessions with kids. She wanted to use some chicks and ducklings in her photos for an added Spring touch but didn't want to keep them and she knew I was a sucker for more birds. The problem here was that Taylor had never raised birds before and didn't think about things like food, water, or that it was 60 outside and that was super warm for us in March, but was about 40 degrees colder than those babies would need. We ended up picking them up a few hours early because they weren't doing so hot and had Charlie with us carrying a washtub full of birds through a public park, much to the amusement (and mild confusion) of everybody else. We learned from this experience that the ducks were much hardier than chicks. Thus began the duckling frenzy at the house, but we were sorely unprepared for the madness that ensued.

Those two ducklings, who were originally named Queso and Quackers (I think the names have changed a few times now after the introduction to the kids), were the impetus for more chicks. Unfortunately, we hadn't had them long enough to understand the ins and outs of duck raising, but it was an opportune time because we had chicken and guinea eggs hatching in the incubator at the time. It was only later that we realized what a bad idea it was to have ducks with other birds and just how gross they could be. They are super cute, but so gross.

Queso and Quackers came in with four other chicks, and then we had the other birds hatching along. The ducks grew at what was probably more than twice the rate of the chickens and the bigger they were, the more of a mess they made with the water. To be able to eat, ducks also need water. With a duck bill, most of the water goes out the back and ends up everywhere but in their face. The brooder gets soaked daily, and they cry without their water if you try to take it away. They also need to be able to get their entire bill into it to keep their nostrils clean so a shallow waterer doesn't work well. This massive amount of water where the brooder turns into a swamp is not particularly ideal living conditions for other birds. The other birds had to be taken out pretty quickly because the ducks dwarfed them and would accidentally step on them or shove them around. Once they were moved into the new brooder, six new ducks somehow made it home with us from buying chicken food and joined them. Then, we had an order that I "accidentally" purchased with four runner ducks. They were by far my favorite but appeared to have some sort of disease and after a couple days, only one was still alive. We put a stuffed animal in with her and she seems to think it's her friend. She gets carried around a lot more than our normal birds because she's alone, so I suspect she will be much more people-oriented as a full-grown duck.

Baby ducks are adorable. They waddle around on their cute little webby feet and look at you sideways with their buggy eyes and run up to the edge of the tub and chirp at you to pick them up. They want to snuggle up to your face or crawl through your hair and nest in it like a tunnel. They chatter at your jawline and will nibble on your hair, and then fall over because webbed feet don't climb well. They are some of the most personable babies we've ever raised, especially when you compare them to guinea keets. The guineas are absolutely terrified of everything by day two and never seem to bond well. At best, they vaguely tolerate handling. The ducks, on the other hand, like to be held and crawl around. After they get a little older and can produce their own oil to keep them dry, you can also put them in the bathtub or other water to swim around. They love going in the water and it is one of the most precious things ever to see. It's a good thing they're so cute though or nobody would raise ducks.

If you go in to your local farm supply store, you might be tempted to buy a duck or six. After some of our issues, I'm thinking some advice might go a long way for you to learn from my mistakes. The first thing is to go ahead and set up one of the 100 gallon stainless steel stock tanks and line it with plastic (like a trash bag cut in half). Once you get the bedding in, either hang the waterer and put a pan under it, or put the waterer on a larger bowl or dish that has a screen over it. This will catch a lot of the excess water and keep it from getting all over the bedding. You might as well start with a gallon waterer and go from there, because anything less will have to be filled up several times



Duck snuggle.

Duck brooders.

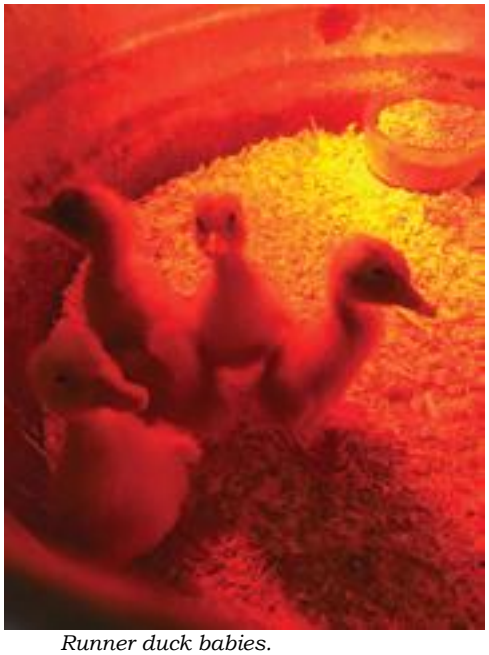
Ducks in the bathtub.

a day. If the water totally soaks the bedding, it's not a smell that you would want to become acquainted with, and it will take a shovel to get everything out of the tank. The heat lamp will help dry out some of the wetness, but the ducks get hot a lot easier than other birds and will start panting if you leave the light on.

Although in general it's recommended to have their food and water close together, you don't want it to be too close or they'll ruin the food. They will love mealworms, and it's really fun to throw them in the tub when they swim and watch them chase after the floaters, so go ahead and buy a couple bags of those. Eventually, they'll eat greens but it might not be for a few weeks.

I'd also suggest not buying ducks until the last minute, or ordering them online, so that when they get to be too big or too stinky for your house, you can go ahead and put them outside without worrying about the temperature. They can acclimate to ambient temperature a lot faster than chicks and are ready to go outside a pretty good bit before the other birds. That being said, our second batch of ducks is still with the guineas and chicks, and they all seem to get along fine. The guinea keets are super tiny still, but they are pretty aggressive and can hold their own against the bigger birds. I'm not sure if there's any aggression in the ducks, but I haven't seen any issues so far. I also can't tell the difference in males and females, but supposedly the females are loud and quack and the males hiss and have a curly butt feather. Some breeds have differences in appearance, but if you order from a hatchery, they'll mark the ducks with a band on their legs so you know which is which.

Once they are ready to go outside, they need a pen and some sort of highly ventilated coop. They can't roost like chickens, but they need a safe place because most domestic ducks don't fly well and are sitting ducks (ha!) for predators like your neighbor's dog. They do like a lot of humidity and would love to have a small swimming pool or pond if you have it. Otherwise, they don't absolutely need water to play in, but they definitely prefer it. Ours will have one of those blue plastic kiddie pools once it's a little warmer. They were getting daily baths in the tub. Now that they're outside, they're not



Runner duck babies.

Maggie, Henry and the duck babies.

coming back in the house – so they'll just have to wait.

Overall, I'd probably get ducks again given the chance. They have a great personality and are very photogenic. They are decent egg layers and are a good addition to the pest control around the house. I would change the timing of our purchases in the future to accommodate the outdoor transition faster as my biggest concern. If you feel like you're up to the challenge, more power to you and I hope you have great success. I think it's always great to pursue a new challenge on the homestead, at least as a learning experience if nothing else. The ducks are unlike any other bird I've ever raised. I think some of it is being a water bird, and some of it is just that they are strange. If I get the option in the future, I will absolutely let a mama duck raise babies instead of hand raising! BC

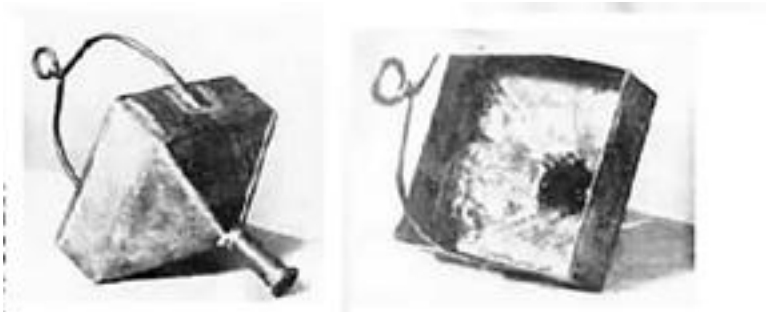
Jessica Louque and her husband, Bobby run Louque Agricultural Enterprises, a contract research business specializing in apicultural studies. They're also raising kids, poultry and bees in NC.

Using Your Extractor

Jim **Thompson**

I saw a discussion on the internet that asked how to use the extractor that a person had purchased. That started me thinking about **all** of the extractors out there and some of the things that people don't usually think of.

Credit is being given to Major Franz Elder Von Hruschka for inventing the first honey extractor. It consisted of a special tray on a rope and you would place honey comb in the tray and swing it around your head. Presto, the honey would separate from the comb and settle in the bottom of the tray. Or maybe I should say that the honey would separate from the side of the comb that is on the bottom if the cappings had been disturbed. The honey above the center rib would be trapped by the comb. In order to get it, you would have to pry the comb away from the tray, turn it over and spin it again. It sounds like an activity that should definitely not happen in the kitchen. Now how fast do you have to spin the tray? What would happen if the rope broke or became un-tied? Okay let's move outside and swing it near the bees. Bees just love to pick up movement with their compound eyes. They might even teach you a new dance while you are trying to extract honey.



Device that Hruschka demonstrated the centrifugal force on uncapped honey comb.

Maybe that is why you haven't seen one of those early extractors for sale. However there were two U.S. Patents issued for similar devices.

I looked in the 1879 Root catalog and I found that there were 10 different extractors for sale by the A.I. Root Company and it depended upon what type frame you were using as to which extractor you should purchase. For instance, No. 1 extractor was for the Gallup frames or any frame that was 11½ inches long and not more than 12 inches deep. No. 2 was for the American frames. No. 3 was for any frame not more than 12¾" long and 12½"deep. No. 4 was for the Adair frames. The list keeps going up to 10. Thus you start measuring frames to see what size extractor you need. It could put you in a jam if you have all kinds of different sized frames. The extractors' No. 1 to 4 had short cans and the frames were placed in the extractor just like they would sit normally in the hive. So the frames rested on the ears and the side of the frame was against the screen. On extractors No. 5 to 10 the frames were placed in the baskets so that the top bar was vertical.

The discussion usually begins as to which way you should turn the crank to get the best results in extracting honey? The correct answer is to spin the frames so the bottom bar leads the way, but honey will still be spun out if you spin the frame in the other direction.

Oops, let's think about this a moment. When bees build comb, they build the cells sloping upward from the center rib at an angle of 10 to 14 degrees. So when a frame is placed in an extractor on the cord or as it usually rests in a hive and spun there is a slight blockage of honey by part of the comb. That is because the vector force is straight out from the center of the extractor. If you turn the frame 90 degrees and put the frame in the tangential extractor you have some natural draining being accomplished by gravity but now you have another force caused by the air that is meeting the comb in the spinning motion. However it is slightly better than the extractor where the frames were put in horizontally.

With the tangential extractors, you will have to make a decision as to when you are going to stop spinning and turn the frame around. If you forget, the weight of the honey on the inside of the center wax rib may become too heavy and break the foundation. The common practice is to spin until you have gotten about half of the honey out of the first side, stop, reverse, spin all of the honey out of that side, stop, reverse and spin out all of the honey out of the first side. However if you use plastic foundation, it is usually strong enough to withstand the weight.

There is another kind of tangential extractor sometimes called a reversible. This extractor has swinging baskets that hold the frames. Some of the extractors in this category require the operator to stop the extractor and turn the baskets while others have a brake and all you do is slow slightly, hit the brake and all the baskets will swing at the same time. Usually you continue to turn in the same direction, so think about the angle of the cells and the efficiency of the extractor. At one time you are spinning the frames in the best direction and after the reversal you may be spinning in a less efficient direction. One way to solve this problem is to reverse the direction the frames are spun at the time that the frames were reversed. However I am talking about theory and measurable results and is it worth the wear and tear on some of the extractor parts and can you actually measure the difference? You are rarely going to get absolutely dry combs out of an extractor.

The best way to dry the combs or frames is to put them in a super on top of a hive and let the bees clean

Novice Extractor - No. 2 for the American Frame or for any frame that is less than 12" long and 12 1/2" deep

them up. You want to avoid open robbing as it may lead to hives being robbed and nastier tempered bees. Remember to remove the empty frames or supers before Winter.

The Buckeye Extractor was an interesting extractor as it had four baskets on the hand powered model and six baskets on the powered model. The baskets were linked together and by hitting a lever you could reverse all baskets at once even under full speed. Because it was a tangential extractor, it also had the problem of achieving the best vector force due to the cell angles. The reason that we don't see many of these extractors is due to the fact that the Radial extractors or Simplicity extractors, as the Root Company called them, were introduced about the time that the Buckeye Extractors were being marketed.

The radial extractor has frames placed in the extractor on the radii. The top of the frame is against the reel of the extractor, thereby allowing the cells of the frame to slope outward. With the radial extractor, honey is spun out of both sides of the frame at the same time. There is no reason to stop and reverse directions. But for the theoretical student, the vector forces from the cells on opposite sides of the frame are different because of the spinning force of the extractor. In hot climates, the beeswax comb of new frames has been known to collapse on the top bar.

A precaution one should take in using a radial extractor is not to double stack the extractor. Double stacking is the practice of putting a frame in between the frames that are seated in the reel. Yes, it would seem that spinning the honey out of 24 frames, rather than 12 on each load would make a quicker job of extracting. However every cycle must be spun longer because of the extra frames and the chances of an overbalance problem or a frame slipping out of place exist. Overbalancing an extractor may lead to wear and tear on the bearings of the extractor and some of those bearings are very difficult to find replacements.

The Two Frame Waponketa Extractor was made by Standard Churn Company and was ahead of its time in some respects because it was a two frame radial extractor. People that own one of these extractors might think that it is a one frame extractor because it has only one basket. The basket is 12 inches wide so you can use only two of the shallow frames or two of the half depth frames. If you tried to use one full depth frame, you would find that the extractor would not perform satisfactorily.

Because the "Medium" depth frames measure 6-1/8" deep, they won't fit unless you shave them slightly. To load the frames, you turn the center yoke upward to clear the basket. The basket tilts outward so you can load and unload the frames. Make sure that the top bars of the frames are next to the end of the basket. Put the basket back in the vertical position and turn the yoke in to the spinning position.

The Cabinet extractor is an extractor that has a horizontal central shaft and the frames are put into frame holding areas that will allow the frame to be spun longitudinally around the shaft. There is virtually no vibration with this type of extractor. However it is a very heavy machine due to many cast steel pieces.

The commercial extractor was developed so that you can load several frames, usually a super full, at each extractor position from the conveyor. The extractor has a horizontal shaft. The advantage to this type of extractor is the loading and unloading of the frames plus the out of balance problem is much less. Most of the other extractors tend to walk when there is an out of balance problem so they

may have additional weights put on the extractor or be chained to the floor. Some have found that a triangular foot system is much better than the four foot method.

There was a High Speed extractor built for extracting honey from combs such as Permacomb. Permacomb is/ was a plastic frame with fully drawn cells. The main idea with this type of extractor was that it would spin the frames so fast that the cappings would be blown off of the cells. Therefore you would save time by loading the frames into the extractor directly from the supers and no time would be spent on uncapping. Sounds good but the beekeeper needed to be watchful of the extractor and check on the bearings and loose bolts as the extractors had been known to fly apart.

As you can see there are types of extractors and methods to harvest the honey. Theoretically there are problems with most of them because of the cell angle or construction. However the general centrifugal force is usually great enough to extract the honey from the comb and overcome those smaller forces. BC

Jim Thompson is a long time beekeeper, historian and collector of beekeeping equipment. He lives in Smithville, Ohio.

References:
1879 Root catalog
Collection of Extractors – personal and bee museum pieces

Got A Question?

Ask Phil

Phil **Craft**

He Knows!

Send your questions to Phil at
phil@philcrafthivecraft.com
www.philcrafthivecraft.com

A beekeeper in West Virginia writes

I'm just having the strangest issue. ALL three of my hives are fighting and killing out of their own hives. They are NOT fighting with other hives. They seem to be fighting over food. But I don't know why because I have a massive top feeder inside the top and I'm putting one or two cup feeders at each entrance.

I had only been using feeder cups but then I noticed they weren't fighting other hives, they were actually fighting their own. So I went to a top feeder thinking if they could go up & down to feed it may lessen the fighting.

I have one hive that's DUMB!! I'm so serious. I have a top feeder in them for past two days, and none of them can figure out how to go up. Instead, they are going down to the cup and then killing each other.

I keep finding two dead bees interlocked with each other. What is going on with my bees? All three hives are nice too. Their behavior is pleasant.

Phil replies:

It's much easier to explain what's going on than to deal with it. The best course is to take precautions to prevent such a situation, but unfortunately you are past that. Your normally pleasant bees are robbing each others' hives.

Bees perform a series of tasks over the course of their short lives and perform them in specific ways, not because they are smart or dumb, but because they have evolved to behave that way. The ultimate outside job for most bees is the collection of nectar and pollen, and they are quite efficient at it. So efficient that each healthy colony can collect food for its immediate needs and for Winter stores, and have enough left over to furnish honey for our kitchen tables. Bees are programed to seek out nectar, bring it back to the hive, and communicate the location of the source to others. Even when a colony already has an excess of food stores, its bees continue to search for more because that's what bees do. In a dearth, when outside food is scarce, they sometimes find it in a nearby hive. Strong colonies can usually defend themselves, but weak ones risk being gutted. Occasionally robbing leads to a sort of feeding frenzy in which multiple hives rob each other, sometimes extending to an entire apiary.

Robbing is a natural behavior but, in the practice of the un-natural art of beekeeping, we create conditions which make it more likely and more severe. Honey bee colonies in nature are located hundreds of yards apart; we sometimes cluster hives 20, 30, or more in a single location. That means both that the little burglars do not have far to go and that robbing cues are communicated more quickly to more hives. Beekeepers can also abet thievery by open feeding: the practice of placing an open container of syrup somewhere in or near the apiary as opposed to using in-hive feeders. This can have the effect, especially during a dearth, of training bees to seek out non-floral food sources such as a neighbor's stores. I am obviously not a fan of open feeding; the same objection applies, to a lesser extent, to entrance feeders. I think that – far from being too dumb to go up to your top feeders – your bees were simply too busy defending themselves from robbers attracted by the easily accessible cup feeders at the hive entrance.

Setting frames or supers off a hive in the course of inspecting during a dearth can trigger robbing behavior. I learned this the hard way. I once removed a super of honey from a hive, not aware of how weak a nearby colony was. The super was only off for a few minutes, but the result was death and mayhem: food reserves robbed out, bees killed, and an entire colony lost. You have an opportunity to profit from my example of what not to do.

It's too late to prevent robbing this time, but there are steps you can take once it has begun. First, immediately stop feeding. Next, restrict the size of the entrance. Entrance reducers give the colony a smaller opening to defend. In lieu of reducers you can use grass clippings, rags, or crumpled newspaper – anything you can stuff into the entrance to block it completely or partially. The advantage of grass is that the bees in the home colony will remove it themselves when it's safe to do so.

Honey bees have very short term memories, so robbing is usually a one day event. As long as the stimulus is removed, they will forget all about it overnight. Whatever material you used to pack the entrance can be removed at dusk or early the next morning. In hot weather, screen or hardware cloth will restrict access but allow airflow. A sheet draped over the hive has the same effect. Another option is robbing screens, sold by beekeeping suppliers. These allow limited movement in and out by the occupants of the hive, but discourage robbing bees from going to the entrance where they smell honey, and going straight in. I insert them at the first sign of robbing.

A lot of damage can be done before a beekeeper notices robbing and has time to take action. In the future, try to prevent it by avoiding practices which trigger it. BC

Save The Bees!

You can eat the larvae.

Ross **Conrad**

Given current projections, by the year 2050 there will be approximately nine billion people living on Earth. Estimates are that our food production will need to almost double from what it was in 2005 in order to feed everyone. (Alexandratos 2012, Tilman 2011) Despite the "feed the world" promises of today's modern industrial agriculture and techniques that seek to harness Genetically Modified Organisms, pesticides, GPS technology and expensive machinery for food production, there are still nearly 1 billion chronically hungry people worldwide.

An inefficient system

Our current agricultural system is woefully inefficient burning many more calories of energy than each food energy calorie produced. For example, consider the energy consumption of a hypothetical purchase of a fresh-cut non-organic salad mix by a consumer living on the East Coast of the United States. A lot of gasoline, diesel and electricity are used during the tilling, planting, fertilizing, application of pesticides, irrigation, harvesting, transporting, processing, packaging, refrigerated transport, and refrigerated storage. And that is just to get the product into the grocery store refrigerated display.

To purchase this salad mix, a consumer likely travels by car or public transportation to a nearby grocery store. At home, the consumer refrigerates the salad mix for a time before eating it. Subsequently, dishes and utensils used to eat the salad may be placed in a dishwasher for cleaning and reuse – adding to the electricity use of the consumer's household. Leftover salad may be partly ground in a garbage disposal and washed away to a wastewater treatment facility, or disposed, collected and hauled to a landfill. Although not comprehensive, this packaged salad mix example illustrates an accounting of the energy use related to producing, distributing, consuming, and disposing of this product. While organic, biodynamic and permaculture agricultural practices all help to reduce the total amount of energy used to produce our food, how it is produced is not the only thing we have to change. In order to meet our future nutritional challenges, what we eat, and how it is packaged, transported, stored and consumed must all be reevaluated.

One possible alternative

One area that appears ripe for more research and expansion in order to improve the energy efficiency of our food supply is insects. According to taxonomist Yde Jongema at Wageningen University and Research in the Netherlands, there are over 2,000 edible insects in the world. While edible insects have traditionally been a large part of human diets, in some societies such as ours, there is a degree of distaste for their consumption. While uncommon in Western countries, some African and Asian countries have a long history of eating honey bee larvae and is it often revered as a special delicacy.

Drone development time from egg to harvestable larvae is eight to nine days. While honey bee brood can be harvested from colonies at different stages in the development from larvae to adult, to maximize biomass of the harvested brood it is best not to harvest before the larvae stop feeding, which is at the time of capping. Honey bee larvae at this stage will have increased in weight almost 1000 times and protein content will have increased almost as much. This growth rate is much faster than the growth rate of more traditional protein sources such as cattle or chicken. As pupae grow older, there will be an increasing amount of chitin produced for the developing cuticle making the brood less palatable. The cuticle is fully developed just before emergence when the brood resembles an adult and imparts an unpleasant taste (Schmidt & Buchmann, **1992**).

While freezing is the most common method of preserve larvae and pupae, smoking and drying are sometimes used. Brood can reportedly be frozen for up to 10 months without adverse effects. In China and Japan, drone larvae are canned for export and even though there is not a large demand in European and American markets, canned bee larvae and pupae, sometimes coated with chocolate, may be found in some specialty ethnic food stores.

The traditional aversion to insect foods in Western civilization appears to be based on custom and prejudice rather than any established health or safety concerns. Despite this, it has been estimated that the average American eats about two pounds of dead insects and insect parts a year that end up in vegetables, rice, beer, pasta, spinach and broccoli. For example the hops used to brew beer, can contain large numbers of aphids. Even the U.S. Food and Drug Administration guidelines for the allowable "levels of natural or unavoidable defects in foods that present no health hazard for humans" includes insects. Moreover, companies like Pepsi have experimented with using cricket and **mealworm powders** in its products. (Garfield, 2017)

Honey bee larvae have traditionally been eaten fresh and raw right out of the hive along with the honey and pollen in the combs. These days however, some Asian countries will prepare honey bee pupae (in the white or pink eye stage) for human consumption by boiling or pickling. While both open and capped brood will stay alive at room temperature for a few

hours, fresh larvae and pupae should be refrigerated as soon as possible and freezing, drying, boiling, roasting, baking or frying should take place within 24 hours after collection to avoid spoilage since insect proteins decay much faster than beef, chicken, lamb or pork.

A Nutritional Powerhouse.

Research into the nutritional value of honey bee brood indicates that it is high in carbohydrates and protein, contains all the essential amino acids. Brood is a good source of phosphorus, magnesium, potassium and the trace minerals iron, zinc, copper, selenium and most of the B-vitamins, as well as vitamin C and choline. The fat content provides a balanced composition of saturated and mono-unsaturated fatty acids with only about 2.0% being polyunsaturated fatty acids. (Abd Al-Fattah 2016, Ghosh 2016, Finke 2007, Crane 1999)

Eaten fresh and raw, honey bee larvae are sweet and fatty tasting. When not frozen, honey bee brood is quite fragile, and can rupture easily, especially if it has been frozen previously. This softness, however, is also part of their gastronomic potential, and if preserved well bee brood can bring a surprising and unique element to a dish. While raw larvae at room temperature are soft and plump, in the mouth they can be popped with slight pressure from the tongue, releasing a mouth-coating liquid within. Raw pupae at room temperature are slightly firmer as a result of their later developmental stage and so resist pressure a little more than the larvae, though they contain a similarly viscous interior. When cooked or dried they tend to retain their shape and are pleasantly crunchy with a rich nutty flavor.

As more and more beekeepers utilize the culling of capped drone brood as as part of a natural Varroa control strategy, drone larvae and pupae has the potential to become a commodity. However production of bee brood is highly reliant upon adequate food availability within colonies and brood production becomes problematic during periods of prolonged dearth such as during a drought for example.

Nordic Food Lab

The consumption of insects in the Western World is perhaps most prevalent in the Scandinavian countries.

According to author Daniella Martin, when cooked just right, drone brood tastes like bacon. This is the inspiration for the BEE-L-T sandwich.

Choose larvae just before they start to spin their cocoon, after they have emptied their gut.

This is partly due to members of the Department of Food Science at the University of Copenhagen who have developed the Nordic Food Lab as "a non-profit, open-source organization that investigates food diversity and deliciousness." In 2013, the Lab launched its Insect Project to fully explore why, unlike most of the developing world; the Western World doesn't eat insects. This effort has been condensed into the first book to holistically explain entomophagy, the human use of insects as food, titled: *On Eating Insects: Essays, Stories and Recipes*. However, the Nordic Food Lab is most commonly known for its sister institution Noma, Copenhagen's world-famous restaurant run by Chef René Redzepi where insects are a regular part of the fine dining experience.

An Entrepreneurial Frontier

While American restaurants have been slow to embrace edible insects, one new entomophagy business that is looking to change this situation is called Laroua and is based in Vermont. The founders of the business are two recent University of Vermont graduates, Kitty Foster, who graduated with a degree in Nutrition and Food Science, and Julia (Jules) Lees, who took a Food Anthropology class while getting her degree in Anthropology. As Jules explains it, it was their common background in sustainable agriculture that led the duo to start the business. ". . . What has really been good about this business for us is that it is at the nexus of our mutual interests in food systems, nutrition, and environmentalism. It's an opportunity to encourage beekeepers to organically control their *Varroa* mites while at the same time creating an additional food stream from something that would otherwise be a waste product. And it's good for you! It feels like it takes all of our interests and brings them into one."

Laroua is seeking to establish a market for bee larvae that is supported by top chefs who are advocates for sustainable, nutrient-dense food sources. At the same time they will create an additional revenue source for Vermont beekeepers who manage their hives organically and through restaurant promotions, conscious diners provide the beekeeper with recognition for their efforts. From Jules and Kitty's perspective, drone brood removal as part of a *Varroa* control program adds to the branding of drone brood as human food, potentially helping to sustain the beekeeping industry by providing a new source of revenues for beekeepers.

Let's not forget the nutritional value of wax moth larvae!

The company currently pays beekeepers $5 a pound for drone brood in the comb. "I think a lot of people don't do anything to control their *Varroa* mites so I feel like there's a huge niche for us to come in and say, 'you need to control your mites, your bees are dying because of the mites and, we'll pay you to do it,'" says Jules. Laroua's company slogan is "Save the bees. Eat them."

Recipes

For the adventurous, here is a basic recipe for: Garlic Butter fried Bees (adapted from FAO 1996)

¼ cup butter
6 cloves garlic
1 cup cleaned honey bee larvae/pupae

Directions: Heat the butter over low heat in a frying pan or pot. Slowly fry the garlic so that in about five minutes it is slightly brown. Add the bee larvae and continue frying at the same temperature for another five to 10 minutes, stirring occasionally. Do not overheat or the garlic will burn.

Meanwhile Daniella Martin, author of *Edible: An Adventure Into the World of Eating Insects and the Last Great Hope to Save the Planet*, and host of the website **Girl Meets Bug**, the insect cooking/travel show, posts the following on her website:

"Bee larvae, when sauteed with a little butter and a few drops of honey, taste very much like bacon.

"Sometimes, when I talk about eating bees, I hear concern about the problems plaguing bee populations. Naturally, I would never recommend a bug-gredient that is threatened.

"I primarily eat drone larvae, which I get from from beekeepers whom I've bee-friended.

"…Many beekeepers have a special comb just for drones, which they sometimes use as bait for potential parastites.

"Periodically, they remove this comb altogether, toss it into the freezer to kill any 'extras' like mites, and then either throw it away or feed it to chickens, if they have any. If more people knew how delicious they are, I think the chickens might have to peck elsewhere!"

Bee-L-T Sandwich

Ingredients:

- Bee larvae
- 1 egg white
- 1 tsp butter
- 1/4 tsp honey
- 1 tomato
- 1 leaf lettuce
- 2 slices of bread
- 1 tbsp mayonnaise
- 1 pinch salt

Sautee the bee larvae in the butter, with a tiny bit of salt and a few drops of honey. Once larvae become golden brown and crispy-looking, remove, and mix into enough egg white to cover and bind them into a mass. Then return them to the sautee butter, pressing them together into a patty.

Toast bread, and slice tomato. Spread mayonnaise on toasted bread when ready. When bee patty becomes firm, place it atop the lettuce and tomato on the sandwich. Enjoy!

…And for those of you who may be hesitant to eat your beloved honey bees, perhaps this recipe I came across for one of the honey bee's major pests, the Greater Wax Moth, will be more to your liking.

Popmoth (adapted from FAO 1996)

Heat some coconut oil and drop fresh (live) or frozen wax moth larvae into the hot oil. Their skin will break and the proteins will expand, making them look like popcorn. Remove them before they become too dark, let the oil drip off them and salt or flavor them to taste similar to popcorn or potato chips. Consider drizzling them with honey for a sweet treat. BC

Bon Apetite!

Ross Conrad is the author of Natural Beekeeping: *Revised and Expanded Edition.*

References:

Abd Al-Fattah M A, Sanaa A Mahfouz and Enas O Nour El-Deen (2016) *Nutritive composition analysis of honeybee* Apis mellifera L. *brood as edible insect: Chemical composition and amino acids content*, Journal of Sports Medicine and Doping Studies. DOI: **10.4172/2161-0673.C1.009**

Alexandratos, N., and Bruinsma, J., (2012) *World Agriculture Towards 2030/2050: The 2012 Revision No. 12-03 (*Rome: Food and Agriculture Organisation*)*

Crane, Eva (1999) *The World History of Beekeeping and Honey Hunting*, Routledge, New York, pg. 551

Finke, Mark D., (2007) *Nutrient Composition of Bee Brood and its Potential as Human Food*, Ecology of Food and Nutrition, 44:4, 257-270, **DOI: 10.1080/03670240500187278**

Food and Agriculture Organization (FAO) of the United Nations, *Value Added Products From Beekeeping*, FAO Agricultural Services Bulletin 124, pp. 257 and 261

Garfield, Leanna (2017) *PepsiCo has experimented with mealworm powder for its snacks and drinks*, Business Insider, Accessed April 8, 2018 at **www.businessinsider.com/pepsico-alternative-protein-mealworm-powder-2017-5**

Ghosh, S., Jung, C., Meyer-Rochow, V.B. (2016) *Nutritional value and chemical composition of larvae, pupae, and adults of worker honey bee*, Apis mellifera ligustica *as a sustainable food source*, Journal of Asia-Pacific Entomology: 19(2) 487-495

Jensen, A.B., Evans, J., Jonas-Levi, A., Benjamin, O., Martinez, I., Dahle, B., Roos, N., Lecocq, A., Foley, K (2016) *Standard Methods for* Apis mellifera *brood as human food, Journal of Apicultural Research*, DOI: **10.1080/00218839.2016.1226606**

Schmidt, J.O. & Buchmann, S.L. (**1992**) *Other products of the hive. J. M. Graham (Editor*), *The hive and the honey bee* (pp. 927–988). Hamilton, IL: Dadant & Sons.

Tilman D, Balzer C, Hill J and Befort, B L (2011) *Global food demand and the sustainable intensification of agriculture*, Proceedings of the National Academy of Science 108 *20260–4*

Let's Be A Beekeeper In England

Just for fun, let's move to a cottage just outside a village in England and have four hives of bees in the back garden. Keeping bees strong and healthy today is a challenge everywhere *Varroa* is found. Since the bees need our help we need to see what is available here to keep us informed on good beekeeping practices. It is also always fun to discover a nearby beekeeper and share information as well as "swarm stories."

A good start would be to find if there is a local beekeepers association. There is one in the county! It's the Northampton Beekeepers Association (NBKA). This particular association was started in 1882. That date is an indication that this area must be a good one for bees. Over 75 local associations exist all over England. It would be interesting to attend meetings at some other ones not too far away.

The NBKA meets on Saturdays. Their website (www:northantsbees.org.uk) provides a map as well as directions to the meeting site, the Abbey Baptist Church Centre. The club meets monthly (except for August). A look at their yearly programs shows a good variety of speakers and topics. The October meeting is an all-day affair with a Honey Show. That will be fun to enter.

In addition to the regular meetings, you are encouraged to attend practical sessions at the Association's apiary on Sunday mornings. The open-hive sessions start in early May and are held through the first two weeks in September. Training courses for both beginner and intermediate stage beekeepers are given. Many local associations have an apiary for teaching purposes and have similar courses. The NBKA newsletter is quarterly. A swarm retrieval list is available. The association has a library that lends beekeeping books to members.

Many other valuable bits of information are given on their website. It certainly looks like a very active bee association. A few things were mentioned in their list of speakers and topics that will need further investigation. One was the presentation at a meeting by a seasonal bee inspector. Another talk will be about the BBKA. One meeting program mentioned BIBBA. Information about these three items are necessary, especially the bee inspection.

The National Bee Unit (NBU) is part of a government department that covers England and Wales. It is involved with assisting beekeepers with control of pests and diseases. It has a legal duty to identify and deal with the two notifiable diseases in the UK, American and European foulbrood. Beekeepers are encouraged to sign up for BeeBase on the website where they can receive information about keeping healthy bees. In addition they will be notified of outbreaks of AFB and EFB or exotic pests in their area, The NBU has both full-time bee inspectors as well as seasonal ones. Beekeepers who suspect disease problems can request inspection. Beekeepers who have signed up on BeeBase will have their information recorded on their site for future reference. The NBU is now involved with the possible UK invasion of *Vespa velutina*, the Asian hornet that has caused severe honey bee problems in France and Spain. Beekeepers, as well as the public, have received publicity about this hornet so that any nests discovered can be destroyed. The NBU also has plans to deal with invasion of the small hive beetle and *Tropilaelaps* mites.

Honey bees have been an important part of British life for centuries. Although different stocks of bees are kept in England, the original one is *Apis mellifera mellifera*, sometimes called the Black bee since it is quite dark. It is the bee that was brought to America by the settlers. Some of the genetics remain in America's bees today. In the UK this bee is being conserved and bred by members of BIBBA, Bee Improvement and Bee Breeders Association. BIBBA was formed in 1964 for the conservation, restoration, study, selection and improvement of native or near-native honey bees of Britain and Ireland. Near-native bees are ones that retain genetics of the Black bee but also have other bee genes.

The BIBBA magazine, *Bee Improvement Magazine*, is published for members about three times a year. A number of local associations called Groups are scattered around both England and Wales. The activities of these Groups include giving information on management of bees, queen breeding and distribution of breeding stock. BIBBA members are encouraged to use local stock for breeding. Workshops are held with both lectures and practical work.

A BIBBA three-day Conference is held biennially. One will be held this year, September 7-9, 2018. All beekeepers are welcome. Presentations, 45 of them, are divided into three categories: Bee breeding, bee improvement and queen rearing is one category. Another is on general beekeeping topics and the third is titled From Beginner to Intermediate. Attending the conference certainly

Ann **Harman**

would be a good opportunity to learn more about the Black bee.

Now to see what BBKA is. Founded in 1874 the British Beekeepers Association is the principal national beekeeping association with about 25,000 members from all over the UK. These beekeepers are individual members of local associations that are affiliated with the BBKA. Being a member of the Association has many benefits; among them are a series of courses and exams, liability insurance, an annual convention, as well as a monthly membership magazine – BBKA News. If a local association is searching for a speaker, it can contact BBKA for their list of speakers. Schools and school children benefit from BBKA information packs for schools. The BBKA is also participating in the nationwide publicity and search for the Asian hornet.

The one notable part of BBKA is the course of exams that beekeepers can elect to take and earn certificates. Although the syllabus was established many years ago it is always being updated to include information from new research. The many exams fit into different categories that beekeepers can elect.

In keeping with the BBKA's interest in encouraging youth, if you are under 18 years old you can begin with the Junior Certificate. This exam consists of 10 minutes of oral questions and a short, written paper.

Then you must make a frame for a hive and present your beekeeping diary. The information needed in the diary can be found online.

No matter how long they have kept bees, all beekeepers will begin with the Basic Assessment. All the information needed to prepare for this and other Assessments (exams) can be found online (**www.bbka.org.uk/learn/examinations**). The requirements for the Basic Assessment are simple: you must have managed at least one colony for a minimum of 12 months. However, when you read through what you need to know for both the Practical and the Oral parts you will realize that you must be a well-informed beekeeper. The practical exam will not be given using any of your hives but will use one (or more) selected by the Assessor (examiner). The entire exam is not expected to exceed one hour.

This Basic Assessment has four parts: (1) Manipulation and Equipment: handle bees and equipment and describe what is observed. (You will be asked to take a sample of bees into a small container.) (2) Oral questions on Natural History and Beekeeping. (3) Oral questions on swarming, swarms, swarm control and effects. (4) Oral questions on diseases and pests. In this Basic Assessment scientific names are not required. In order to pass and receive the Certificate you must have 50% correct in each part.

Once you have your Certificate in hand you have a choice of quite a number of other exams. Progressing through your choices can take as long as seven years. You can find details online at the BBKA site and on a useful infographic at **www.bee-craft.com/bbka-examinations-structure/**. Under the Qualified Beekeeper group of exams you will find Intermediate Theory, with its Modules or Modular Examination subjects. Written exams are given for all Modules. The General Husbandry Certificate is listed as a practical exam. From there you can progress to Master Beekeeper with its section of Advanced Theory containing all seven Modules and the Advanced Beekeeping practical exam. Booklets on the various subjects are available for study. You can purchase Past Paper Bundles from the Shop section of the website. The Bundle for each Module examination is a set of six papers for the past three years.

After passing the Basic Assessment you might wish to choose from four different separate Certificates: Honey Bee Health, Microscopy, Honey Bee Breeding, and Show Judge. The Show Judge group of exams has the choice of a written part with two Modules or the General Husbandry Certificate. You must also serve as a steward and a judge at specified shows. The Judges Record Book, kept over five years, is a necessary part of the exam.

If you have passed the Basic Assessment and wish to continue with only practical exams without written ones you can progress to the General Husbandry Certificate. You must have been beekeeping for three years.

You will have two Assessors who will come to your apiary and inspect it and your equipment as well as your honey handling equipment. You will then open one or more colonies

The Bee Farmer *is another UK Publication, aimed at commercial beekeepers.*

for manipulation. In addition you will demonstrate a method of queen rearing.

The Advanced Husbandry Certificate, also a practical one, is especially designed for those beekeepers who wish to give presentations and demonstrations at meetings and conferences. The Assessment covers a number of different topics. One or more colonies of bees will be manipulated. A presentation of a practical topic will be given to an audience. Dissection for tracheal mites will be demonstrated, as will nosema analysis. The Queen Rearing exam will be both discussion and practical. Other tasks for this exam are listed on the website.

Having a beekeeping library is very important. So it is time to search for sources of bee books. Two excellent sources were found as well as some magazines. Northern Bee Books has a huge selection of both new and second-hand books on bees and beekeeping. Two magazines were listed: *The Beekeepers Quarterly* and *Natural Bee Husbandry*, both described as international English language journals. On the Northern Bee Books website you can sign up for The Bee eBook Paper to receive information about new books.

BeeCraft magazine is a monthly magazine with articles for all beekeepers. On the website you can view some free copies of complete issues. (**www.bee-craft.com/see-inside-our-magazine/**). As well as practical beekeeping articles, scientific presentations and interviews with interesting beekeepers, you will find news from the world in the section "Around the Colony." Another section, "From the Lab." gives the latest in bee research worldwide. "B Kids" consists of two colorful and attractive pages especially for children (of all ages!). Notices of forthcoming conferences encourage beekeepers to plan attendance. The magazine has excellent photographs illustrating important parts of the articles. After a tour of the free copies it is easy to see why the magazine has received six international medals for beekeeping journals.

BeeCraft also has a selection of very useful books and booklets, as well as the Apiary Guides. These Guides are on separate beekeeping topics and are designed to be taken to your beeyard to provide information when examining a colony of bees. Book topics include bee anatomy, diseases and pests, bee flowers, making mead, among others.

The scientific research part of beekeeping will be found at IBRA, International Bee Research Association. (**www.ibrabee.org.uk**). The award-winning *Journal of Apicultural Research* publishes scientific papers on bee research from around the world. Another publication, *Bee World*, contains articles submitted from all over the world on honey bees, beekeeping and also on all other types of bees. IBRA also sells a wide range of books that include some on the history of beekeeping.

It is really a big world for beekeepers here in England. Associations, meetings and large conventions, ongoing research, helpful magazines and books, honey shows, beekeeping supply companies, short courses, and examinations to pass for Certificates! BC

Ann Harman has been all over the world teaching and talking about beekeeping. She makes her home in Flint Hill, Virginia.

CALENDAR

♦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♦

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

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

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

♦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**.

♦NEW YORK♦

Understanding and Meeting Your Bees' Midsummer Needs July 28 at the Pfeiffer Center in Chestnut Ridge.

For information visit **www.pfeiffercenter.org or contact info@pfeiffercenter.org**.

♦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.**

♦VIRGINIA♦

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.**

Beekeeper Botox

I'm seventy five,
Not that you would know.
Won "Young Beekeeper Awards"
Twenty years in a row.

Park Avenue doctors
Got nothing on me.
Got natural, free Botox
Direct from my bees.

Every sting that they land,
Rolls my age back a day.
Daily venom injections
Keep wrinkles at bay.

It's no longer my honey
That people come for.
"Just tell us your secret!"
They yell through my door.

"Out back's where I keep
My surliest hive.
Just bang on their lid
To extend all your lives."

Bang on it they did.
But, to their surprise
The bees that emerged
Were Africanized!

Peter Keilty

National Pollinator Week Webinars

June 19 and June 21

Featuring Healthy Hives 2020 researchers

June 19, noon – Dr. Stephen Martin and Randy Oliver
Project: Establishing the Deformed Wing Viral (DWV) diversity across the U.S.

June 21, noon – Brandon Hopkins and some of his participating beekeepers
"Heirloom" Honey Bees (research on cryopreservation of bee sperm to find genes that could improve genetic diversity)

www.BeeCulture.com/kimandjimshow/ to Register

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.

Check Us Out At

- **www.BeeCulture.com**
- **www.Facebook.com/Bee Culture Magazine**
- **Twitter.com/beeculture**

Sign up for the FREE News Service **– CATCH THE BUZZ – at BeeCulture.com, and read hundreds of recent BUZZ posts at BeeCulture.com/category/catch-the-buzz**

Ed **Colby**

There's A Time For Everything

I used to dream that I was in college again, with finals approaching, and it would hit me that I'd signed up for classes that I forgot about and never attended. I'd get this sense of impending doom.

Sometimes I forget about my two hives at 8,400 feet on the Colorado Flat Tops. But it's not a dream.

These colonies tested zero for mites in September. I wanted to see if they could successfully overwinter under the snow. There are no other bees in the vicinity. The only *Varroa* mites are ones I bring up there with my bees. So if they can survive up there year-round, I won't have to worry about them loading up on mites from neighboring hives, like my Flat Tops bees sometimes do when I bring them back to civilization for the Winter. This is only an experiment. If it works, maybe I can select for even more year-round high altitude colonies that can resist mites with no chemical treatments. I wintered these two in three deep supers, dead-heavy with honey. At least they won't starve.

The gal Marilyn and I slogged in on skis to pay them a visit in February. We had one of the lowest snow years on record, but there was still 30 inches on the ground. I dug the solar electric bear fence charger out from under an inverted bucket under the snow. It still popped, even though the woven wire fence around the bees lay half-buried under the snow. I heaped snow around the hives for extra insulation, and we headed for home.

So far, so good. I figured I'd come back every two weeks or so to monitor the situation. The last thing I need is for my battery to go dead and a Spring bear to rip everything apart. I can't get a truck in there until May.

It's April 10 as I write. Our bees-and-skis visit was over two months ago, and I haven't been back since. Marilyn just said to me, "I wonder how the bees are doing up there. Do you think the snow's melted? "

I said, "I have no idea." And that's the truth.

Things get a little hectic this time of year. My bees that pollinated the California almonds arrived home two weeks ago, and now some verge on starvation. Some need mite treatments. I just got off the phone with a California queen breeder. My first queen shipment arrives day after tomorrow. As soon as they get here, I'll start making hive splits. Later today I pick up bees that pollinated apricots and sweet cherries in Palisade. The growers started spraying their peaches, so these bees need to come home now.

I'm working on my 2014 taxes. That's not a misprint. If you get more than three years behind, and you have a refund coming, the government gets to keep it. So April 17 looms large for me. I hope you never let yourself get behind like I did.

This morning I got interviewed and filmed by a Colorado Mountain College photo journalism class.

The students were as cute as a litter of spotted puppies. They spent what seemed like hours setting up all their equipment. Then they put me in the spotlight and peppered me with questions. Their project involved talking to and filming a spectrum of beekeepers, from hobbyists to commercial. I fall somewhere in between. When one young woman wondered if I felt a "spiritual connection" to my bees, I said, "Well, I adore them and call them 'my little darlings.' Does that qualify as a spiritual connection?"

When asked my reaction to hobbyist beekeepers who blame all the ills of honey bees on their commercial brethren, I replied that some commercial beekeepers blame backyard beekeepers for the *Varroa* pandemic. It's easy to point fingers. I told her that as president of the Colorado State Beekeepers Association, and as a matter of personal philosophy, I try to eschew name calling and radical positions and instead relentlessly pursue a middle path.

I found these young people hopelessly enchanting. They reminded me of a time I often forget – when the world loomed fresh and clear, not yet smeared by hypocrisy and spite. It's all in our point of view, don't you see?

I almost spaced out the photography class. I credit Divine Intervention for keeping me on track. It hit me like a bolt out of the blue. I said to Marilyn, "Uh-oh! CMC's sending out a photo journalism class to interview me about bees, sometime in April. I wonder what day. I hope it wasn't today! I'd better check my schedule."

I came back a few minutes later. "No problem," I said. "They're coming tomorrow. I'll just postpone my appointment to visit my billionaire client's bees and host these fledgling photographers instead."

"I thought you were going to Palisade tomorrow," Marilyn said. "That's in the afternoon," I said."This is in the morning."

You see? I just need to juggle my schedule a little. And check it occasionally. There's time for everything.

Blue Sky bee supply®

LYSON PRO UNCAPPING BENCH

Uncap your honey frames directly into this reinforced stainless steel uncapping tank.

LYSON W230 MOTORIZED EXTRACTOR

This economical extractor is designed to give you years of operation without breaking the bank.

LYSON

LEGA TABLETOP SLICER

This simple and ingenious system makes this slicer truly revolutionary!

LEGA 15 FRAME POWER RADIAL EXTRACTOR

Same features as the 5/10 frame hand extractor but with the highest quality german made 110 volt motor available.

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

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

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

FOR BEES. FOR HONEY. FOR EVERYONE | (877) 529-9BEE | www.blueskybeesupply.com

EXTRACT THE SAVINGS

HH-130

Mann Lake Ltd.
FREE SHIPPING
Mann Lake Ltd.

HH-215

2 Frame Plastic Extractor

- Economical
- Great buy for beginning beekeeper
- Heavy duty, food grade plastic design

$159.95

Motorized Radial 18/9 Frame Extractor

- 115 volt variable speed control
- 90 volt, gear driven motor
- Perfect for beekeeper with 10+ hives

$1295.95

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.