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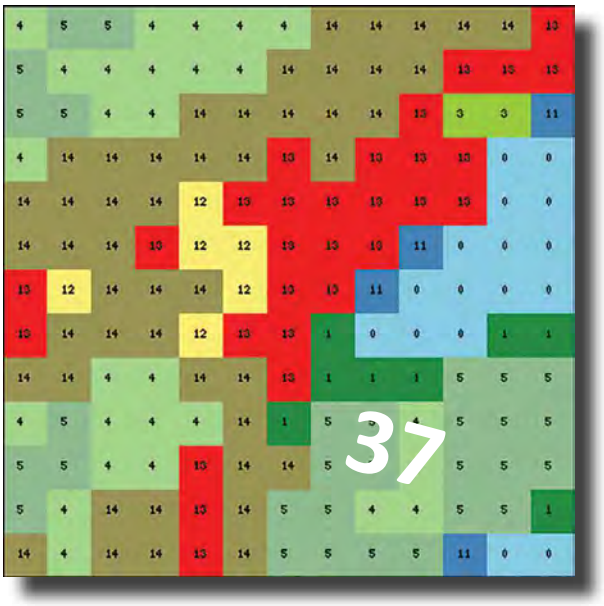

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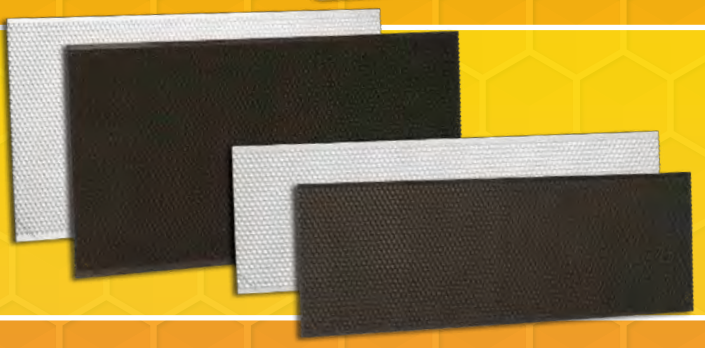

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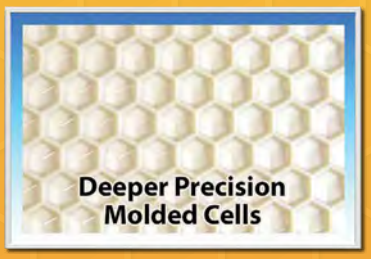

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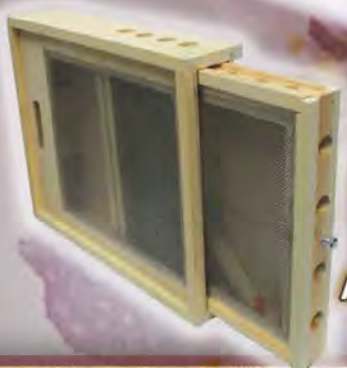

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Norm Adams
Freeland, MI

The Organic View

I produce an internet based radio show called The Organic View which has a global listener base of over three million people. In light of the much heated debate about neonicotinoids, I decided to produce a special series called "The Neonicotinoid View" which is co-hosted by my friend and fellow bee health advocate, Colorado beekeeper, Tom Theobald. The purpose of this show is to provide a platform to discuss current events and news about neonicotinoids. In fact, it is the only show that explores this subject.

The show has featured well-respected scientists such as Dr. Henk Tennekes, Dr. Dave Goulson, Dr. Randolf Menzel, Dr. Susan Kegley, Dr. Vera Krischik, Dr. Chris Connolly, and numerous others. It has also featured well-respected beekeepers such as Jeff Anderson, Jim Doan, Darren Cox, Randy Oliver, Tibor Szabo, Walter Haefeker, in addition to government officials and environmental advocates from the Center For Food Safety, Friends of The Earth, etc. The fact that these folks have made time to come on the show has demonstrated the need for open communication. The show is a valuable communication channel to the global beekeeping community and the general public at large.

As you know, there has been a great deal of controversy surrounding the use of neonicotinoids. By design they were meant to kill. It almost seems absurd that there has been such a long, drawn out debate about whether or not they kill bees as well as other pollinators. When you consider how much money is to be gained by their continued use in agriculture as well as in gardening, it isn't too hard to figure out.

Be that as it may, there has been great resistance by industry. The efforts to suppress the information about neonicotinoids are relentless. There has been a rash of propaganda pieces that have been circulating from industry to denigrate, diffuse and distort the science, the profession of beekeeping and the efforts to raise awareness by concerned citizens.

During the course of the last several months, the information about neonicotinoids that I have freely provided for so many years to the public has been sabotaged. Some interested party or parties wanted this information to be suppressed. Fortunately, with several months of hard work, my team has been able to restore the information and it is available on TheOrganicView.com for anyone who wishes to receive it. To listen to the archived shows, please visit **http://theorganicview.com/wiki/Main_Page**. For the show schedule, go to **www.theorganicview.com/other-shows** If you would like to make a donation or support our efforts going throughout 2015, please send a donation via paypal to **donations@theorganicview.com**.

I always encourage readers to look at the source of information with a healthy skepticism and determine whether or not if there is a tie to a party that would financially gain from the distribution of that information.

I cannot emphasize enough the scientific debate which industry has always demanded. This debate has occurred in Europe and was based upon research from all over the world.

The scientific process in Europe has been comprehensive and has generated sufficient information for U.S. EPA to act now. There is no need to repeat that process or to pretend this never happened. I would encourage U.S. EPA to take a closer look at the European decision making process because it's already done the review of the scientific evidence. Industry was given ample opportunity to present data demonstrating the safety of their products but what they provided was unconvincing to the scientific experts at EFSA who were responsible for making the decision. After that, there was a fierce political debate about whether or not to follow the recommendations of the experts. Industry lost this debate as well. Industry did not accept the results of the scientific debate. They did not accept the results of the political process. They have chosen to take the European Commission to court, challenging the ban. Sources close to the case believe that this challenge will also fail.

American bees are not on a different planet. The science applies here as it does in Europe and elsewhere in the world. The results are just the same. Will the US EPA ever act?

June Stoyer

Bee Culture

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

What About Varroa?

I read your Inner Cover article in the February *Bee Culture*. You wrote about many of the things you learned at the at the two national bee meetings in December. You stated that one researcher found that high Nosema spore counts correlated with low *Varroa* populations. This is certainly counterintuitive. I would expect that bees weakened by *Varroa* would be more susceptible to Nosema and that vice versa bees weakened by Nosema would be

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more susceptible to *Varroa*. Did the researcher propose any reason for this apparent anomaly? Are the *Varroa* getting sick from Nosema? Are the worker bees sick from Nosema flying away with hitch-hiking *Varroa* and dying out in the field? These bees don't seem to be reading the book on how diseases are supposed to operate.

Mike Johnston

Editor's Note: *The report stated the results of last year's BIP survey. Dennis vanEngelsdorp made the presentation, encouraging beekeepers to take part in the survey this year. Interesting, and in this case curious information is to be discovered.*

Great Inner Cover

Kudos to Kim Flottum for his informative editorial INNER COVER in the February issue of *Bee Culture*. Sharing the results of the Reader's Survey was a great idea. The extremely high overall reader satisfaction rating for *Bee Culture* is quite impressive. Kim, in his capacity as Senior Editor, can rightfully claim a great share of the credit for this high rating. He obviously is making the correct decisions regarding the content and presentation of articles. His timely reports on current information gleaned from beekeeper's meetings around the country keeps all of us in touch with the real world of beekeeping, including hobby as well as professional beekeeping. I appreciate his willingness to share his wisdom and enjoy his philosophical comments, based on his many years of experience in beekeeping and writing as well. When each issue arrives I turn to INNER COVER first! A BIG thanks Kim!!

Norm Gary
Davis, CA

And thank you Dr. Gary.

Beekeeping Should Change

It was an interesting January, bookmarked with the American Beekeeping Federation (ABF) meeting at Disneyland at the front end, and ending with the American Bee Research Conference (ABRC) in Tucson, Arizona at the end.

These are quite different meetings. The ABF attracts around 900 beekeepers, many managing commercial operations with upwards of 10-70,000 colonies. The ABRC is much smaller, around 100 participants, mostly honey bee researchers, extension agents and government regulators.

I was left with a sense of optimism from both meetings, unexpected since beekeeping continues to flirt with an epic disaster caused by 1/3 of all colonies dying every year. This has been going on for a decade now, with colonies dying each year and replaced by beekeepers splitting their surviving colonies and building up their numbers again each Spring.

But apiculturists are beginning to realize that many of the issues causing the demise of our colonies are outside our control. Of particular concern are a lack of abundant and diverse nectar and pollen sources due to the vast weed-free, single-crop acreages typical in farming today, and heavy use of pesticides by farmers.

This is a long-term problem not easily amenable to change. Even long-term transformation is problematic since political pressure exerted by the beekeeping industry has little influence, because it is a tiny industry lost in the vast magnitude of contemporary corporate agriculture.

I observed two positive trends in hallway conversations that are encouraging. The first involves recognizing that beekeepers' interests and those of agriculture as it is practiced today are not necessarily compatible. Finding alliances with other organizations with allied values could create a considerably more effective coalition lobbying to shift agriculture in a direction healthier for bees.

Beekeeping could be leading a movement towards more sustainable farming rather than buying into the large scale and high input agricultural systems that too many beekeepers are enmeshed in. If so, there are innumerable interest groups with which to align: organic growers, sustainable farmers, the urban and local food movements and a vast array of environmental

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Jan Lohman and her partner Vince Vazza, commercial beekeepers in the pacific northwest, are in the Bee Informed Partnership program because they are concerned about the continued health of their bees. When you buy bees and queens, ask to be sure your supplier is in the BIP program. Make sure your bees are as healthy as can bee. photo by Dan Wyns

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groups, among others.

The love-hate relationship beekeepers have developed with pesticide companies might be one alignment worth pondering. Traditionally, we've been anti-pesticide, recognizing that many field chemicals are toxic to bees. For that reason, beekeepers often have been in the forefront of movements for stronger pesticide regulation.

Ironically, beekeepers also have become dependent on those same companies to invent and market new chemicals to control bee diseases, pests and parasites. Like the farmers we criticize for overuse and reckless applications of pesticides in fields, we beekeepers ourselves have stepped onto the same chemical treadmill, losing credibility and the high ground in campaigns to reduce pesticide use and implement stronger regulations. It's common for beekeepers to apply mite-killing chemicals four to six times a year, a sure recipe to induce resistance in the mites through over-application, as well as leaving considerable residues in comb.

Which brings up the second trend I noticed at these meetings, a realization that beekeeping itself has to change. Many, perhaps most, commercial beekeepers are no longer primarily honey producers, but have become pollination managers, moving their bees from crop to crop for the pollination fee, with honey a messy byproduct.

These are enormous mass migrations, with 60% of American bees moved onto just one crop, almonds, each February, about 1.6 million colonies, and many colonies moved three or more times a season to various crops (Canadian beekeepers are somewhat less migratory). These beekeepers have come to depend on the high fees they charge growers for pollination, but income is offset with steep costs for labor, equipment, transport and travel, not to mention stress on bees and beekeepers alike.

I have yet to find an economic analysis that shows migratory beekeeping is the optimal way to make money in the beekeeping industry. Stationary beekeepers who leave their colonies at one apiary site all year, or perhaps move only once and more locally, may not get the high pollination fees, but they also don't have the costs. Many migratory beekeepers are starting to question whether moving bees is the best way to make a dollar.

Beekeepers also are striving to get off their self-induced chemical treadmill, and flock to sessions at meetings with speakers claiming to be managing their bees free of synthetic pesticides and antibiotics. Some talk about embracing gentler strains of African bees because they swarm often, which breaks the *Varroa* mite's breeding cycle. Swarm prevention has always been high on a beekeeper's management agenda, but perhaps that type of out-of-the-box thinking will be necessary to evolve a sustainable beekeeping industry.

Another innovative idea I heard floated was for beekeepers to metamorphosize into pollination habitat managers, contracted by growers to create and maintain habitat, nesting sites and forage for wild bees. Honey bees would be used as supplemental pollinators only when necessary, and at much reduced colony numbers from the current migratory avalanche.

Honey bee health and survival can improve, but only through a combination of agricultural change and the evolution of beekeeping itself.

When you sit down for dinner, thank a beekeeper.

Planners of beekeeping meetings, here's a session idea for your next conference: Audacious Ideas for the Future of Beekeeping.

That's what the survival of beekeeping needs: daring and bold ideas, and the courage to implement them.

Mark Winston
Professor and Senior Fellow
Simon Fraser University
Vancouver, BC

Fish Bait

In the early Spring of 2014, I lost a new hive to who knows what (my bad beekeeping)? The wax worms took over – again! Looking at the squirming mess I thought, Wow! These are the little guys I pay $3/dozen for to ice fish with. So living on a small private lake I took the single deep, wrapped rope around it so the frames would stay in place, put it in the lake with the frames on end and vertical, in just enough water to cover the box. I put two eight inch blocks on top (it was very buoyant being wood and wax). I left it for a week.

The minnows and small blue gills did a great job. A lot of the travel stain was also removed. I took the frames out to dry in the sun on the dock. The box is now clean and ready to try again.

Bruce Sabuda
Pinckney, MI

What's New This Month?

From tests carried in the apiary, it was found that the colonies treated with ProBee® are more populous and more healthy compared to the control group not treated.

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The vacuum top is made with a 1.75 h.p. modified shop vac motor. Plenty of power for bee removals and I have been using the same vacuum for three seasons now and it keeps on sucking bees. The screen on the catch box keeps the bees from entering the vacuum motor but the peg board on the bottom of vacuum distributes the vacuum pressure across the entire catch box surface so the bees are not sucked to one spot in the catch box. The weight of the top and the vacuum pressure is enough to keep a tight seal. There is no need to clamp or tie the vacuum top down to the catch box. So if you have an unusually large removal you can have two boxes next to each other and just move the vacuum from one box to the next in seconds.

I use the Mann Lake 10-frame Select Deep Hive Bodies for the catch box. It is excellent lumber and they have consistent quality in their lumber and manufacturing. Two coats of Behr Ultra Exterior Primer/Paint. I started making both the Deep and Mediums but for the small cost difference there just wasn't enough demand for the Mediums to justify making them. The Deep Hive Body catch box offers more than twice the capacity of most of the other vacuums out there. The full screen top allows for excellent ventilation, important on those hot Summer days. The standard size allows for emptying the box of bees into your deep hive body with little disruption of the bees. You don't have bees flying all over the place like when you are shaking a bucket of bees into a box because they are just moving downstairs from the catch box to your hive body. The plastic sliding blast gate door that the hose connects to allow's for easy opening and closing and is easy to clean.

Like every other beekeeper that does removals I carry a small gas operated generator to plug into when an outlet isn't within reach of a 100 foot extension cord. The 1.75 hp vacuum motor is more than adequate to use a 20'-30' hose if you need it for high places. Even with a 30' hose you will still leave the valve open a bit to decrease the full vacuum pressure. I have never vacuumed bees with the valve closed tight. I always suggest that you use the shortest hose possible to decrease the number of fatalities. I do 90% of my vacuum work with a 10' hose.

Current direct pricing is $245 (check, pay pal, credit card) plus shipping that includes the deep catch box, vacuum top, and a 10' hose with extension tube. (Additional Catch Boxes $95 plus shipping). The vacuum can also be found on Amazon and Ebay at an adjusted price to cover their charges. One year guarantee on the vacuum top, free replacement, but shipping not covered. I have a short demonstration of the vacuum on Utube under the "bee vacuum" search if you would like to see how it operates.

Contact by email or phone Guy Shingleton, 303.898.1267; **guyse-mail@aol.com**.

My hive Tool A Comprehensive Guide To Beekeeping.

This four DVD set follows three hives through their first year, starting with ordering two packages of bees and a nucleus hive. It follows step-by-step as the hives grow into full-size colonies. Watch what to do and when to do it.

This four DVD set is good for the beginner, and would make a good short course for bee clubs. Not only does it present you with basic beekeeping techniques, it will also give you the tools you need to get started.

Whether your goal is to have honey to eat or sell; more vegetables growing in your garden; or maybe just to help save the honey bees, this video will teach you what you need to get started with confidence.

Disk one covers Honey Bee Anatomy and Basic Honey Bee Biology. Disk two covers hive furniture, beekeeping tools, protective clothing and stings, plus installation of the bees. Then it follows each hive's seasonal growth and development from new Packages and Nucs, step by step reviews, problems and solutions. Disk three covers the most common Pests, Diseases and Treatments and comes with an extra folder that's a spread sheet to help you keep records as well as a digital copy of *My Hive Tool* for your tablet or smart phone. Disk four is details and extras. This disk details mixing feed and medication. Extras include information and cost saving tips and techniques on home-made equipment.

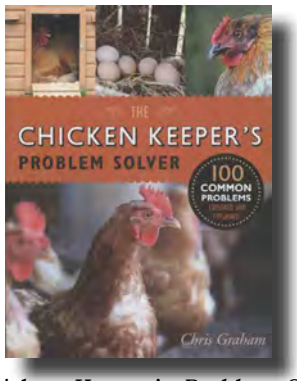
Other topics covered include Races of Honey Bees, Basic Honey Bee Biology, communication, Spring, Summer and Fall management plus wintering.

Over four hours of instruction. Shot in 1080i HD for $39.95. Available at **www.myhivetool.com.**

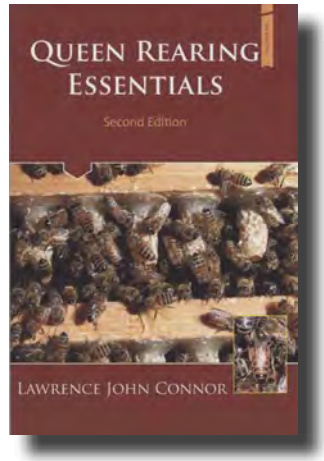
Record Keeping Journals, produced by Quarry Publishing, with artwork by Judy Love. ISBN 978-1-63159-008-5. $14.99/set of three, 25 page, 8¼" x 5¾" soft cover journals. Two-color artwork throughout.

I almost never use the term delightful, but that fits this set of record keeping, or anything you want to write journals. There are three, and they each have their own personality. FREE TO BEE has faintly dotted lines on each page, with an occasional bee drawing, and a couple of pages of artwork. BEEKEEPING has an occasional page of art but is mostly blank pages without lines or dots, lends itself for that spontaneous drawing of the beeyard layout, the Cardinal over there, or something from inside the hive that catches your eye. BEECAUSE has every page lined, and again an occasional page of art. You could use each for a different hive, or all your hive notes in one and notes for greater thoughts in another, and keep one home for sales records and receipts. Uses are endless, and because of their unique style and size and cover art will probably not get lost in the shuffle between uses.

Kim Flottum



The Chicken Keeper's Problem Solver. By Chris Graham. ISBN 978-1-63159-034-4. Published by Quid Publishing. 224 6¾" x 9" pages, color throughout. Soft cover. $20.



Queen Rearing Essentials. 2nd Edition. Dr. Lawrence John Connor. Published by Wicwas Press. 160 6" x 9" pages. Color throughout. Soft cover. $25.

The first edition was about as good as it gets for anybody wanting to learn the art and science of this beekeeping skill, but this second edition is so much better. Starters and Finishers, combined starter/finishers, handling and shipping and moving and selling queens, clipping and marking, using nucs and evaluating what you raise. It's all there. This time though the photos are large, color and excellent. This makes this book, in my opinion, the best queen production book available, bar none. You could probably learn to raise quality queens without reading the text – just looking at the photos and reading the information that goes with them. But the kicker is the chapter on Dave Miksa's Florida operation and how he makes his business work. Dave, a good 'ole Univ WI grad, does everything first class. He and wife Linda and the rest of his family cut no corners, take no chances and produce noting but first class queen cells. Everything. This chapter is what makes this book a stand out. it's worth the price of the book alone. – *Kim Flottum.*

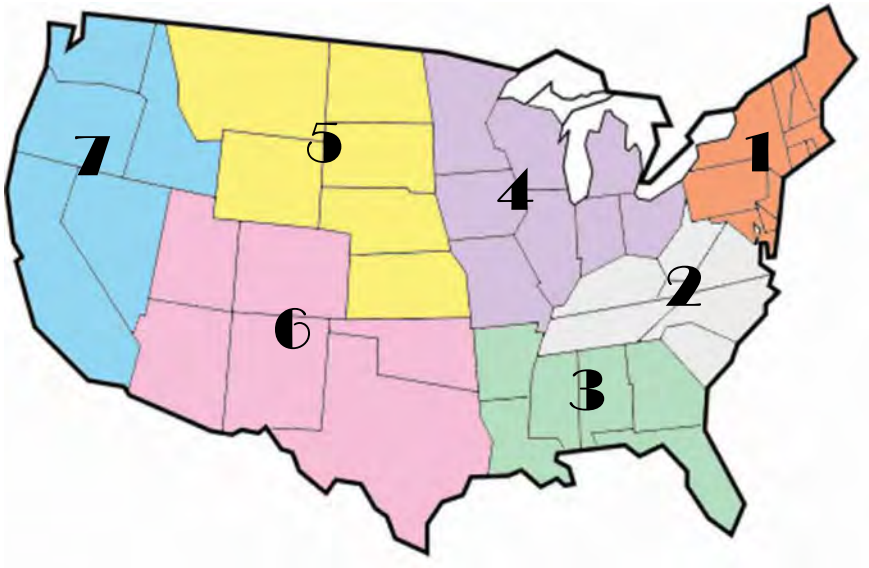
Urban Beekeeping. A Guide To Keeping Bees in the City. By Craig Hughes. Published by The Good Life Press Ltd. ISBN 978-1-90487-1-699. 160 7½" x 9½" pages. Color and black and white. Soft cover. $25.

This definitely British flavored book didn't seem to be quite right for American readers when it first came out and I passed on recommending it. I recently ran across my copy and took another look. It's still very British flavored, but the author has a sense of what's important in each of the 10 chapters. He's also an attorney who went through a near-death experience and cast off his former life to live life. He brings a unique perspective to the book. He looks at the calendar year, then at tasks within each season, including those things one really needs to pay attention to...pests and diseases, swarms, queens, some anatomy, harvesting and hive management. Because the British take beekeeping so much more seriously than we do, each topic has more breadth and depth than most US books, (not all of them certainly), and he throws in some of the more interesting UK requirements that make much of what we do look simple in comparison. A definite sense of humor only adds to the mix. The sections on bee history and folklore are unusual in putting things in perspective, and there's even a gardening section focusing on honey bee plants you've never heard of – but maybe should have. This book has value for every beginning and still learning beekeeper – urban, suburban or country folk.

Kim Flottum

This is the same company that published Jim Tew's Beekeeper's Problem Solver we looked at last time. It's a series they have created and it seems to be pretty good. They find an expert in a field and present them with this challenge – find and solve 100 problems commonly encountered by folks who do what you do. And, since chickens are a part of what we do at home, I was interested in seeing if this was as good as Jim's book. It is. They cover diet, housing, pests and predators and health issues, eggs, raising young ones and behavior problems. I've raised a lot of chickens in my day – 20,000, years ago when I was a farmer – and now a dozen or so. It answered all my questions. So if these birds are in your life here's another tome to help you out. – *Kim Flottum*

APRIL – REGIONAL HONEY PRICE REPORT



Winter Prep

It's been an interesting Winter in many places – some, like most of the east, cold, snow and miserable. Out west, not so much and an easier time was had by many. So we asked our reporters in late February how it went this year, knowing that some hadn't had a chance to check just yet, while others were almost done pollinating almonds. But we also asked what they had done to get ready for Winter, noting their early work. We'll see later this season how that worked out for them.

Did they feed? Nearly 80% of them fed something – not quite all, about 20% didn't have to, or didn't want to. Of those that fed their bees, 64% fed both protein and carbs, 23% protein only, and 31% just carbs. More multiple feeders live in the colder regions with longer Winters, which isn't surprising, but not by a lot.

What about mite control in late Summer and Fall? 73% did something – from home remedy essential oils to any and all of the prescribed treatments. We didn't ask, and should have, if the colonies treated needed treating. Meanwhile, 27% didn't treat. Some said they don't at all, while others said they tested and didn't need any.

Short moves for protection? This meant to a better Winter yard, or maybe closer for inspections purposes – not so much warmer, but easier. And, 32% do move them for that. From outyards to town, all to one outyard, some to an easier outyard to get to.

Moving to a warmer climate (don't we all wish)? Most of our reporters are stationary, but several did move – mostly from north to south, but many of the movers went to California almonds, which counts. Where else? Georgia and Florida were popular on the east coast. Excluding pollination, some moved to lower elevations for warmer weather, some just to more southern parts of the state they live in.

Wintering inside? Only a very few do this. Wintering nucs inside was most common. This was in unheated and unregulated storage, but better than outside.

Wrapping? Yes some do, but not as many as we expected here at Bee Culture. Maybe 10% is all. What do they use. The Bee Cozy was popular, as was the insulated plastic sheet and the waxed cardboard box available. Some used insulation tied to the sides with an insulated layer on top, and good old tar paper is still used too.

Nearly 70% have been able to inspect their colonies. Fewer in the cold north and east, but even there way more than half had trekked out to see. And what did they find, as of late February? 28% found better than expected, 43% found about what they expected, 24% found worse and 6% already came up empty.

	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	2.22	1.95	2.38	2.34	2.26	2.16	2.35	1.89-2.65	2.26	2.26	2.28	2.17
55 Gal. Drum, Ambr	1.95	1.90	2.16	2.35	2.18	2.15	2.20	1.84-2.60	2.15	2.15	2.14	2.04
60# Light (retail)	193.40	217.00	183.00	208.25	209.06	200.50	280.00	150.00-280.00	203.12	3.39	199.68	182.70
60# Amber (retail)	185.00	227.33	181.00	206.14	210.42	181.00	238.33	150.00-295.00	198.34	3.31	193.25	178.24
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	82.63	82.00	60.00	60.58	79.91	86.25	100.00	48.00-120.00	75.83	6.32	78.76	78.50
1# 24/case	123.76	104.00	114.99	97.63	147.84	121.50	133.13	84.00-180.00	116.59	4.86	118.00	106.53
2# 12/case	110.82	95.00	96.54	91.19	104.08	95.60	112.00	72.00-144.00	100.17	4.17	107.53	93.80
12.oz. Plas. 24/cs	94.20	85.67	85.44	80.56	91.19	100.40	103.60	64.80-120.00	89.98	5.00	87.88	83.20
5# 6/case	127.59	100.00	121.33	103.43	122.13	105.20	128.00	84.00-175.00	114.76	3.83	120.02	110.41
Quarts 12/case	157.13	125.00	117.88	134.76	166.32	144.40	136.00	60.00-202.80	136.53	3.79	141.19	127.72
Pints 12/case	112.91	85.75	80.25	89.36	100.95	74.80	96.00	60.00-163.20	90.29	5.02	87.17	83.03
RETAIL SHELF PRICES												
1/2#	4.29	4.12	3.67	3.33	4.54	5.16	6.00	2.90-6.99	4.13	8.27	4.15	4.11
12 oz. Plastic	5.25	4.55	5.13	4.61	5.74	5.98	7.05	3.39-8.99	5.28	7.04	5.06	4.80
1# Glass/Plastic	6.55	6.92	6.95	5.63	7.00	6.77	6.66	5.00-10.00	6.52	6.52	6.65	6.09
2# Glass/Plastic	11.54	11.75	11.20	10.10	11.00	10.92	16.00	6.00-18.00	11.33	5.67	11.83	9.93
Pint	9.74	8.92	8.20	12.05	8.33	9.15	12.13	4.00-21.00	9.52	6.35	8.65	8.56
Quart	15.76	14.96	14.50	16.50	14.00	14.56	17.60	8.00-26.00	15.24	5.08	15.56	14.58
5# Glass/Plastic	26.15	23.25	30.50	22.77	20.00	24.64	30.00	15.00-38.00	24.76	4.95	26.19	22.63
1# Cream	7.79	8.00	9.00	6.38	16.00	7.60	9.50	5.00-16.00	8.09	8.09	8.63	7.45
1# Cut Comb	9.80	8.75	8.00	9.33	10.07	9.50	14.50	4.50-16.00	9.90	9.90	10.44	8.15
Ross Round	7.48	6.50	8.00	9.25	8.48	9.63	8.48	5.00-12.00	8.45	11.27	8.45	7.75
Wholesale Wax (Lt)	5.88	5.17	5.03	5.50	5.16	4.65	5.00	2.00-8.00	5.33	-	5.93	5.08
Wholesale Wax (Dk)	5.52	4.83	6.05	5.35	5.03	2.90	4.75	2.00-8.00	5.07	-	4.91	4.64
Pollination Fee/Col.	85.00	64.50	64.80	68.33	96.50	130.50	131.67	35.00-185.00	83.00	-	82.10	79.05

Join *Bee Culture* Magazine's Exploration of the Four Pillars of Honey Bee Management in October, 2015 at the *Bee Culture* Conference Center (on the A.I. Root Co. campus), 640 West Liberty Street, Medina, Ohio.

Follow Randy Oliver's discussion of every aspect of honey bee nutrition from best diets, how, when and how much to feed, and feeding in preparation for pollination events, wintering, dearth and everything inbetween. Nutrition has become the least understood aspect of producing healthy bees. Fix that here.

Then follow Jim Tew's arctic, and not-so-arctic adventures in wintering. Everything from as far north as you can get to moving bees south for a kinder, gentler winter. Refresh your Winter biology, then get better at wrapping, moving, feeding, treating and all you need to know to get bees from Fall to Spring.

Next, listen in as John Miller and a select group of commercial beekeepers who are in the business of serious honey production share their secrets, their skills and even their mistakes so that they consistently make as much honey as their bees can, every year. And now so will you.

Finally, Pillar Four. *Varroa.* Listen and learn *Varroa* biology, but most importantly, *Varroa* control from Dennis vanEngelsdorp. Get every detail on every *Varroa* treatment. How, when, why, where. *Varroa* control chemistry needs to be perfectly understood to avoid, or reduce wax issues, and IPM *Varroa* controls need to be understood and used as much as, and as effectively as possible. Space is limited. Register early. Watch for details.

A tip of the hat to Gerry and Libby Mack and all of the North Carolina Beekeepers.

INNER COVER

Interesting Times.

Interesting times. We are living in interesting times. That's borrowed from a Chinese curse – that you should live in interesting times, with interesting meaning less than perfect. Some might argue with me here because I refer to the rapid, extraordinary rise in the number of people who want to know something about honey bees and beekeeping. They are making interesting times, indeed.

In this issue Jim Tew shares his experience at the Alabama meeting, expecting something like 600 people to attend and having a far greater number show up for the event. Larry Connor was one of the speakers at that meeting, and between the two of them they share the adventures of dealing with being too popular.

That same weekend I was attending the North Carolina/South Carolina joint meeting where the same surprising event occurred – far more showed up than were expected and Jennifer Berry was at a meeting in Indiana shortly afterward where more than 900 enthusiastic beekeepers attended. I was at one of the first of those meeting and 150 folks were there. Even our local bee club, the Medina County Beekeepers is having growing pains. We typically meet in *Bee Culture's* Conference Room, a large meeting facility attached to our retail store. I say large because for the 16 years we have been there it has been more than we ever needed. This spring, because of several years of high attendance at our beginner's classes, if all 300 members showed up some Monday night, about a third would have to stay outside… and we have the Chief of Medina's Fire Department as a member who would probably enforce that fire code number.

We know the reasons why the interest has swelled, and for the most part are glad that more of the world is paying attention to what's going on in beedom. But having experienced this first hand, and listened to, and watched many, many similar stories unfold across the land the past few years I offer some words of caution for those groups experiencing such rapid growth.

This may sound naïve, but don't let it go to your head. I've seen club leaders make the assumption that all this popularity is the result of their supreme leadership . . . In the best run clubs the leaders may have had something to do with it but almost exclusively all they did was have the club there, just like it's always been there, when the rest of the world wanted one. Reality says that the result of this overwhelming popularity has to do with paper media, social media, the net, TV, word of mouth and even radio. Think about this – if it was indeed your local newsletter and web page, the meeting announcement in the paper and your stint at the fair last Summer – like you've been doing for the last 20 years why did you have to all of a sudden scramble to find a larger room for your meetings, chairs for the room, and make up more handouts. What did you do different? You were no more prepared than any of the rest of us were. Don't let it go to your head.

Here's another problem you will run into. Money, in all sorts of ways. For instance, for all those years when you had 50 or so folks showing up at your spring meeting, that local Amish guy who makes his own supplies and brought in some stuff from the big guys and has a place just up the road shows up and had a table and did what he could to help out. Gave door prizes, was always good to give workshops on something because he always said yes and he knew more than most. Helped set up the vendor area and stayed late and cleaned the place up after everybody was gone. Always paid his dues on time. Bought an ad in the newsletter to help cover the cost of postage. Brought two dishes for the potluck every Summer because those city folks just don't know what a potluck really is. And now, now that you're big and rich and famous, guess what? All those big time out-of-state dealers want in on your meeting. They want and expect two, three four tables and complain if they don't get them and threaten not to come if they can't – and that little guy gets shoved further and further back until finally he's outside. Shame on you.

I know. You have to pay for those new digs and expensive speakers somehow. And all those national dealers have deep pockets, and they are here to do what – make money, that's what, so stick it to them to pay the bills. But we can stick it to the new folks too at registration. What do they know? But in doing so, what happens to the old timers who've been coming for years who used to volunteer for lots of things, held office when nobody else would and things weren't as bright. What about them? Too often they get left in the dust, no matter the loyalty, the history, the dedication of being there from

day one – whether just a member, or that old Amish guy, too bad, you're too old and you're not good enough anymore. I've seen that again and again and again. Shame on you.

The assumptions being made by those clubs that are making this work is that they don't have a clue what to expect. Three years ago at their annual spring meeting they had 50 folks show up with 40 of them preregistering, 200 were there last year but only 100 preregistered – and they will probably have 350 this year because they had 250 register ahead of time – but they prepare for 450 – enough room, handouts, breakout rooms, meals, parking, vendor space, whatever they will need, and enough people to make it all work. And, interestingly, will charge enough to cover those additional costs. Members less, new folks more. It has nothing to do, well, not a lot to do with supreme leadership but simply good planning, which is, of course, good leadership.

Along those lines, do you do what you've always done because that's the way you've always done it? Again it comes down to money. Here's what I mean. Because of the onslaught of bigger meetings, vendors, raffles, swelling memberships and the like suddenly the company coffers have enough stashed away to make any beekeeper blink. How much do you need for a rainy day, really? The folks who hold the purse strings have double duty. They have to make sure the bills get paid…that meeting room, goodies, insurance, speakers, donations…and what else? That's their job. But could you spend more on speakers, coffee, stuff everybody needs to keep bees with that now you can buy, pay freight on and sell to members at cost, maybe even a better place to meet, a summer field day at somebody's place and cover the cost of the day, a picnic that is paid for, an upgrade to the fair booth, stuff for members to use when they give a talk to school kids…the list goes on and on and on. You can give some of it back, you know. How much do you need for a rainy day?

It takes money to make money, and success breeds success. More money on speakers and suddenly more members because of better speakers. More money on a meeting place and more people can attend and be comfortable and hear and see the speaker. More money on cookies, coffee and such at the meeting, and people are more willing to attend, more functions to attend and more people will attend. But keep it locked up and see what happens.

This hinges on another issue – enough help. And here's a notion you can count on. It's not going to be hardly any of those new folks who raise their hand and say what can I do to help? They all have day jobs and families and other time restraints (like you don't). It'll be the regulars…every year mostly the same folks. And pretty soon they get tired of missing the meeting, getting there early, working hard, putting up with the complaints, missing lunch, listening to one more "I'm so glad to be able to help the bees . . .", and then staying late and cleaning up. You can only abuse your best people so long before they aren't your people at all anymore. And then what?

It all comes down to those people who make it work. Volunteers. Whoa – why do they have to volunteer? Who said? Well, that's what we've always done it, right? Why not offer something to folks to run registration – folks who don't want to go to the meeting for goodness sake. Somebody's spouse who cares less about bees, but can use the extra cash. A local Boy Scout or Girl Scout or 4-H group to set up and clean up – for a fee. A Future Farmers group to help with whatever needs helping with – the group gets some funds, the kids get some experience and you get good help and your attendees don't have put up with grumpy volunteers. You can pay people to do the work simply by adjusting the registration fee. Let me rephrase that. You SHOULD pay people to do the work. Really. You pay your speakers (even if they are members) right? You pay for your meeting room, right? You pay for the cookies you give out, right? Not one of those places volunteered to help. When you have enough, why on earth don't you pay the help?

I don't know of any group that's done all of these things, but I'll bet every group has danced with some of them over time. Leaders come and go and with them things get better or not. Conservative officers come and go and things change. And those darn tax and spend liberals come and go too, and things change then, too. All of this is important and necessary to deal with, but it's simply the beesuit you wear when you go out to do what's really important – take care of the bees.

And that's the first priority isn't it. Because if the folks attending your meetings aren't learning how to take care of the bees, pretty soon you won't have all those people coming to the meeting any more because they won't have bees to take care of. Everybody, every time, should leave that meeting a better beekeeper. Everything else – money, leaders, the room, how much coffee, who did what - comes in second. Every time.

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Set of 500: $262.50

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HEALTHY BEES. HEALTHY PLANET.

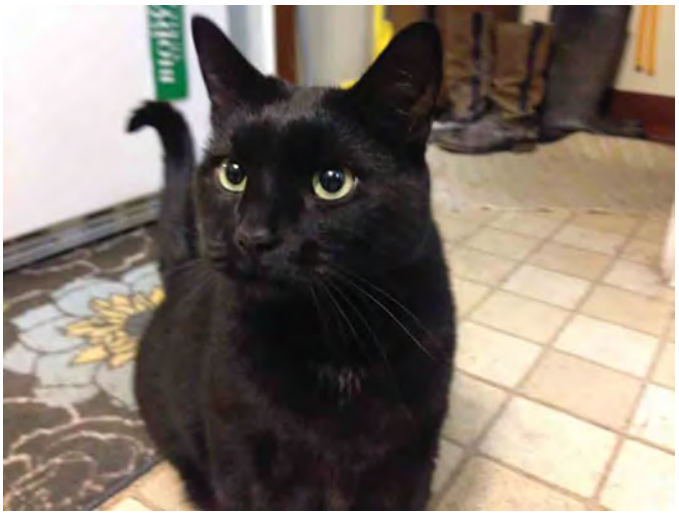
It's Summers Time –

Chickens and Cats and Ducks and More

There's a chicken in the basement. Oh my, what shall we do . . .

This sounds like the beginning of a Dr. Seuss children's book, doesn't it? But we really do have a chicken in the basement. She's been down there for about a week. We have a plant room in our basement – not that kind of a plant room – where she is becoming quite comfortable. Last week we noticed that she started acting funny. She kind of stayed over in the corner by herself and then she started having a hard time walking. As Kim put it she walked like a drunken sailor. She would almost tip over. And she just seemed not quite right. And then it started – the other chickens started to push her around and then began pecking her and getting really aggressive. So we brought her inside and fixed her up in the basement plant room where there are lights and the furnace and lots of green stuff for her to investigate.

I checked her all over. I didn't find any wounds anywhere. I thought maybe there might be something wrong with one of her feet since she was having a hard time walking. But we didn't see any wounds, no swelling, no problems with the feet. After a day or two of staying in the basement she started feeling better, eating more and drinking. Now she's quite at home down there in her very own room. When I go down to do laundry or other chores I open the door and she'll wander out and walk around the basement. Each day getting a little better.



Tonight one of the cats and the chicken had an up-close and personal encounter. They've known each other for three years, but there's always been a fence between them. Chloe, the black cat, is so mellow and sweet – actually she's a big 'sissy.' She wandered downstairs tonight while I had the chicken door open. She started inching closer, meowing softly. The chicken started towards her. So I stopped what I was doing to watch and monitor the situation. As the cat got closer to the door, the chicken stood up straight and tall. Then Chloe started to take a drink out of the chicken's water bowl. Whoa – the chicken stuck out her wings and the feathers around her neck got all ruffled up and she started for the cat. I quickly removed Chloe from the situation, afraid that this might get ugly.

So I think the chicken is probably ready to be incorporated back into the flock. Part of the delay has been the cold. It has been so bitter here that I just didn't want to force her back outside. I'm hoping this weekend to have some time to monitor getting her back into the flock. I'm hoping they'll accept her.

Like a lot of animals chickens are not tolerant of sickly or injured members of the flock. I know it's a defense mechanism, I get that, but boy they were really rough on her. I don't think she would have lasted long if we had not intervened.

The feed stores in town have gotten in their first shipments of chicks and ducklings. We stopped in earlier this week. Oh my gosh they are so darn cute. We're hoping that it will warm up just a little bit, soon so we can get some of each. It has been so cold here for so long. The feed stores will get in several more shipments between now and late March.

At the TSC in town you get a grab bag with the chicks – you don't know what breed or what sex you're getting. You can special order and the chicks will arrive at your door several days later. We have another store in town where we got our chickens and you have a choice of breed and sex. Meyer Hatchery is about 45 minutes away from us, so that's an option also.

So we're going to increase our flock with probably six more chicks and maybe six ducks. Kim is still thinking about meat birds and also quail at some point.

•

Now for more information on our ongoing computer situation. It has been rough on all of us – us at *Bee Culture* and you as well. Change is always hard and this has been no exception to that statement. It has been painful. We are incorporating a new subscription data base into our system and it has been bumpy. We're told it will be wonderful! I am hopeful and optimistic that by the time you are reading your April issue we will have worked out all of the bugs and be back on track.

Have you ever noticed that when you've been on hold or had to wait for a long time for something, the customer service agent will often say "thank you for your patience." I've often wanted to respond "Who said I was patient!" So I'm not going to say that. I just hope that you stick with *Bee Culture* because we are "*Magazine Of American Beekeeping.*"

I hope Spring has arrived at your house. Stay tuned!

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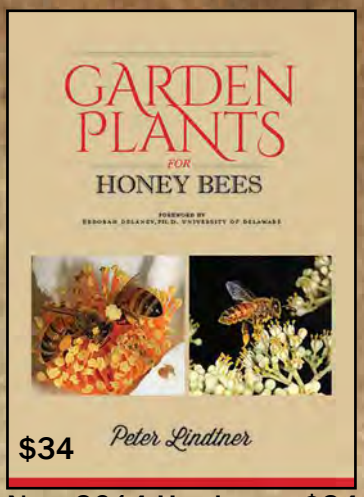

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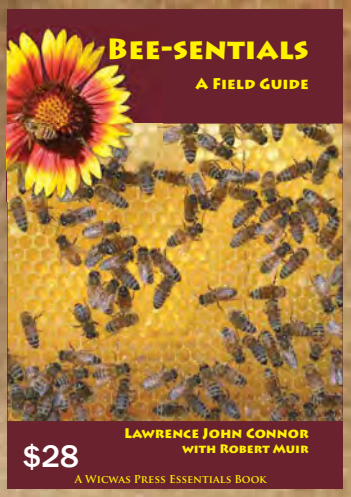

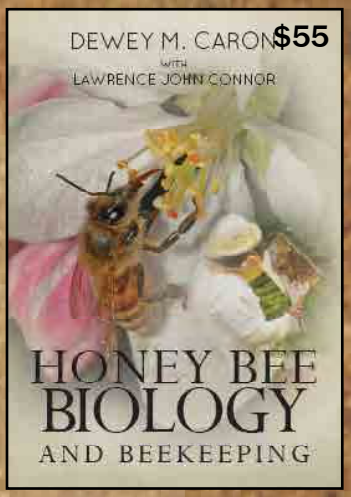

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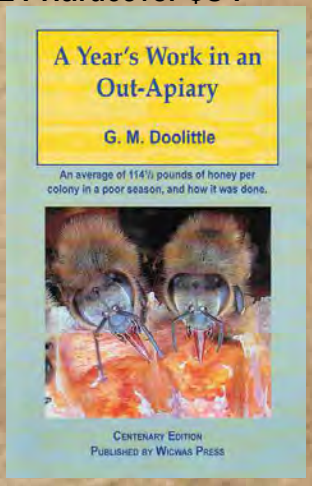

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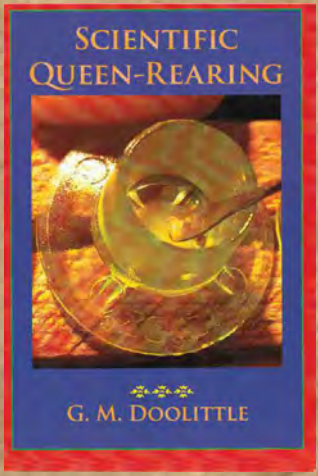

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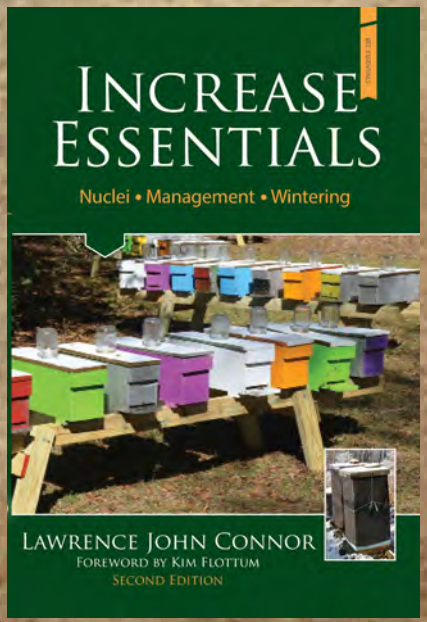

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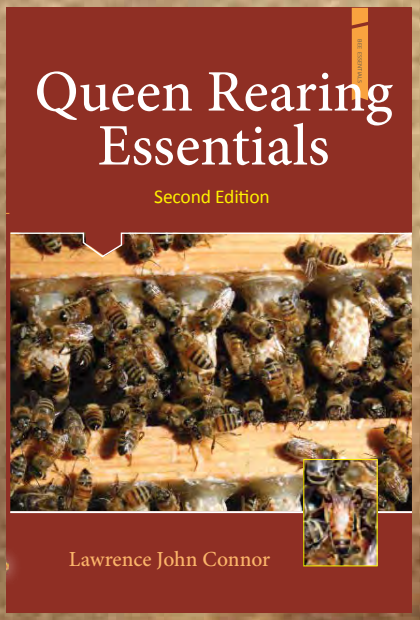

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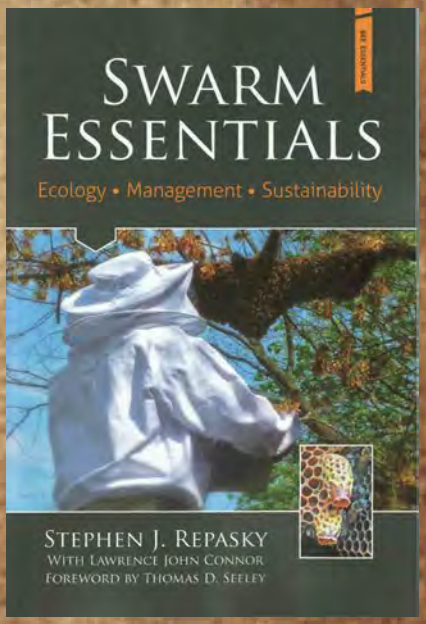

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A Closer Look

VARROA MITE REPRODUCTION

Clarence **Collison**

Reproducing Varroa females lay the first egg in the brood cell approximately 70 hours after host cell capping.

The life cycle of the female *Varroa* mite is subdivided into a phoretic phase in which she lives on adult bees and a reproductive phase occurring within worker or drone brood cells. The reproductive phase is initiated when the female mite leaves the adult host and enters a brood cell with a 5th instar larva shortly before the cell is capped. This foundress female passes between the larva and the cell wall to the bottom of the cell and becomes stuck within the larval food (larval jelly). Approximately five hours after cell capping, the bee larva has consumed the rest of the larval food which frees the mite (Ifantidis 1988). At that time the female mite has already started oogenesis (creation of eggs) in the terminal oocyte (Steiner et al. 1994; Garrido et al. 2000).

After leaving the larval food, the mite begins feeding on hemolymph of the bee prepupa. The *Varroa* mother prepares a feeding site by making a wound in the prepupa cuticle, which is used by all mite offspring including the male. This feeding site is critical for the survival of all developmental stages, because their mouthparts are not strong enough to pierce the soft cuticle of the bee pupae. The infesting mother mite also forms a rendezvous site with her feces on the cell wall on which all mobile individuals aggregate and on which matings preferentially occur (Donzé and Guerin 1994). In cells infested by more than one *Varroa* foundress mite, no aggressiveness between them has been observed and the members of the different families construct and cohabit the feeding punctures and fecal accumulations. The increased number of progeny in such cells does, however, leads to competition at the feeding site.

Female mites may invade worker or drone brood cells when worker bees bring them in close contact with brood cells. The attractive period of drone brood cells is two to three times longer than that of worker brood cells. The attractiveness of brood cells is related to the distance between the larva and the cell rim and the age of the larva. The moment of invasion of the mite into a brood cell is not related to the duration of its stay on adult bees. The fraction of the phoretic mites that invade brood cells is determined by the ratio of the number of suitable brood cells and the size of the colony. The distribution of mites over worker and drone brood in a colony is determined by the specific rates of invasion and the numbers of both brood cells (Beetsma et al. 1999).

Garrido et al. (2000) determined the moment of activation of oocyte growth in *Varroa* females. Ovaries of the mites were dissected and stained with toluidine blue. The coloration of the terminal oocyte indicates the uptake of euplasmatic and/or yolk material and therefore, the initiation of the reproductive phase. In phoretic mites removed from adult bees, no staining of the ovary was detected. Females artificially introduced into freshly capped brood cells and removed for dissection six hours later already showed clear blue staining of the terminal oocyte. The ovaries of female mites introduced 14 hours after capping of the brood cell, however, remained uncolored after incubation in toluidine blue. In phoretic mites, oogenesis is apparently arrested in a previtellogenic phase. Immediately after invasion of the brood cell, reproduction is activated by some factor. This factor is present in freshly capped brood cells but not in brood cells 14 hours after capping. Oocyte growth in reproductive mites depends on the consumption of hemolymph from freshly sealed larvae (Donzé and Guerin 1994; Tewarson and Engels 1982).

"The male mates with the female offspring of the mother mite in the brood cell and only the mother and daughter females emerge from the cell."

Reproducing *Varroa* females lay the first egg in the brood cell approximately 70 hours after host cell capping (Ifantidis 1983; Steiner et al. 1994). This egg is unfertilized and develops into a male, while the three to four subsequent eggs that are laid at approximately 30 hour intervals are fertilized and develop into female offspring (Rehm and Ritter 1989; Martin 1994). However, the last eggs laid will usually not reach maturity, because the developmental time of the immature bee in the capped cell is too short to allow completion of mite

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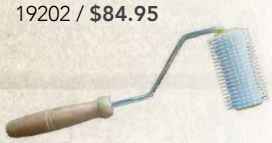

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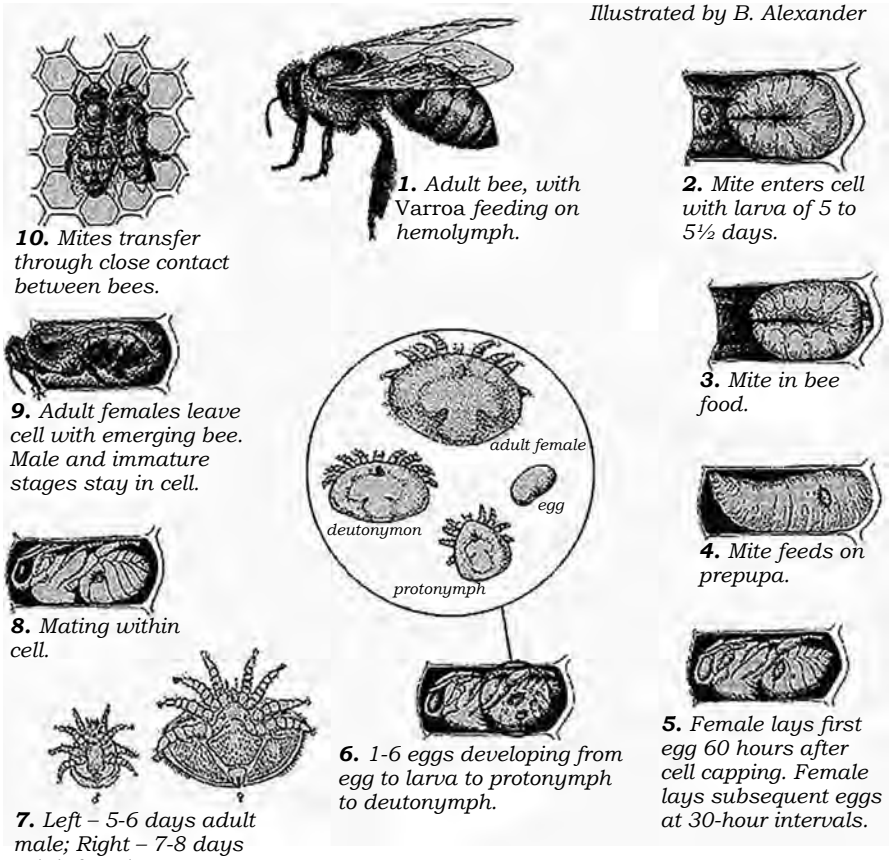

development. Since the capped stage of drone cells is about two days longer than that of worker cells (Jay 1963), drone cells are in principle more rewarding in terms of mite reproduction than worker cells because more young mites can reach maturity. In the European honey bee, mites produce on average two to three viable female offspring in drone cells and one or two viable female offspring in worker cells (Schulz 1984; Fuchs and Langenbach 1989).

The mite larva develops within the egg during the first hours after ovipositon. During the period of time from egg hatch until adult molt, the mite offspring pass through protonymphal and deutonymphal stages. The total development time is about 5.8 and 6.6 days for female and male mites, respectively (Donzé and Guerin 1994; Martin 1994; Rehm and Ritter 1989).

Using transfer experiments, Garrido and Rosenkranz (2003) examined whether the sequence of sexes (first egg unfertilized, followed by fertilized eggs) in the brood cell is triggered by a host stimulus. When reproducing *Varroa* females were transferred from white-eyed worker pupae into freshly capped worker brood cells, 77% of the fertile mites after the transfer began a new reproductive cycle by laying an unfertilized egg. The proportion of brood cells with male offspring was similar to naturally infested brood cells. *Varroa* females transferred into brood cells with young pupae reproduced, but only 6% of the fertile mites after the transfer produced male offspring. This was significantly different from male production in naturally reproducing *Varroa* females and those transferred into freshly capped brood cells. They concluded that a host stimulus present in freshly capped brood cells triggers both the start of reproduction and the sequence of sexes.

The reproductive cycle of the *Varroa* mite is closely linked to the development of the honey bee host larvae. Using a within colony approach, phoretic *Varroa* females were introduced into brood cells of different ages in order to analyze the capacity of certain stages of the honey bee larva to either activate or interrupt the reproduction of *Varroa* females (Frey et al. 2013). Only larvae within 18 hours (worker) and 36 hours (drones), respectively, after cell capping were able to stimulate the mite's oogenesis. Stage specific volatiles of the larval cuticle are at least part of these activation signals. This is confirmed by the successful stimulation of presumably non-reproducing mites to oviposition by the application of a larval extract into the sealed brood cells. Preliminary quantitative gas chromatography-mass spectrometry analyses suggest certain fatty acid ethyl esters which make up brood pheromone, as candidate compounds. If *Varroa* females that have just started egg formation are transferred to brood cells containing host larvae of an elder stage, two-thirds of these mites stopped their oogenesis. This confirms the presence of an additional signal in the host larvae allowing the reproducing mites to adjust their own reproductive cycle to the ontogenetic development of the host. From an adaptive point of view, that sort of a stop signal enables the female mite to save resources for a next reproductive cycle if their own egg development is not sufficiently synchronized with the development of the host.

The reproduction of *Varroa* mites during successive honey bee brood cycles was investigated (de Ruijter 1987). Newly capped worker brood cells were identified and into each cell an adult female mite was introduced. After 10 days the cells were opened and the contents examined. Those females still present and alive were once again introduced into newly capped brood cells and so on. *Varroa* mites were capable of reproducing up to seven times under these experimental conditions. The maximum number of eggs laid was 30 per female. Females that produced only male offspring because they were unmated, kept doing so in subsequent brood cycles. Though in contact with adult males several times, no successful mother mite matings occurred. Probably only young females mate successfully.

The male mates with the female offspring of the mother mite in the brood cell and only the mother and daughter females emerge from the cell. Protandry (appearance of males prior to females) in *Varroa* enables the fertilization of a maximum number of daughters within the limited time span of the capped brood. To be successful, however, the newly emerged adult daughters must encounter a male. However, adult males are scarce, occurring in only 60% of single infested cells due to developmental mortality (Fuchs and Langenbach 1989).

The mating of *Varroa* daughters

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was observed in transparent brood cells with time-lapse video and occurs just after ecdysis (molting) and as soon as they arrive on the fecal accumulation prepared by the mother mite (Donzé et al. 1996). Such females are remated for as long as no other freshly molted daughter arrives on the fecal accumulation. The number of spermatozoa stored in the mite's spermatheca increases with remating, a strong indication for sperm mixing when brood cells contain more than one *Varroa* foundress. The number of daughters per infesting mother decreases at higher rates of infestation per cell, but the proportion of such daughters with a mate rises sharply due to the higher probability of finding a male within multi-infested cells. The number of mated daughters per mother is maximal in cells with two foundress *Varroa* females.

Martin (1995) investigated the developmental times and mortality of *Varroa* in drone cells. The position and time of capping of 2671 naturally infested drone cells were recorded. Six hours after the cell was capped, 90% of the mites were free from the brood food to start feeding on the developing drone. The developmental time of the mite's first three female offspring (133±3 hours) and the male offspring (150 hours) and the intervals between egg laying (20-32 hours) were similar to those found in worker cells. However, the mortality of the offspring was much lower in drone cells than worker cells. The mode number of eggs laid were six and five in drone and worker cells, respectively. All offspring had ample time to develop fully in drone cells with the sixth offspring reaching maturity approximately one day before the drone bee emerged. Normal mites (those which lay five or six viable eggs) produced on average four female adult offspring but since only around approximately 55% of the mite population produced viable offspring the mean number of viable adult female offspring per total number of mother mites was two to 2.2 in drone cells.

Within any mite population, large numbers of mites fail to produce fertile female offspring despite entering a suitable host cell. These can be classed into those that do not lay eggs, those that lay non-viable eggs and those that only produce viable male offspring. Another cause which leads to the production of non-fertile females is the premature death of the male offspring before it is able to mate with its sisters. This situation arises because female mites only produce a single male during each reproductive cycle and this male needs to fertilize all of his sisters (Martin et al. 1997). BC

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GLYPHOSATE

Pollinator Habitat Is Disappearing At Rates Usually Reserved For Descriptions Of Amazon Rain Deforestation

Michele **Colopy**
Pollinator Stewardship Council

If we are to address two of the four honey bee health concerns-pesticides and poor forage (pests, and pathogens being the other two concerns) we must address the use of glyphosate. Research is showing it has sub-lethal effects, damages beneficial bacteria, persists or drifts from one crop to the next, and destroys pollinator forage. Crops can be protected from invasive plants, pollinators can be provided diverse natural forage, and crop yields will be increased due to increased healthy pollinators, but glyphosate use must be part of the discussion of pollinator health. Research has shown crop yields increase with native pollinators, and honey bee health is improved when diverse forage is available while pollinating a crop. Blueberries in New Jersey can see an increase in gross revenues of $112 per acre if one acre of vacant land is available to native pollinators. When blueberries were pollinated by more than one species of bees there was an increase of $311 worth of yield per acre in North Carolina. A variety of crops see yield increases when wild pollinators and their habitat are near crops:

crop	yield **increase** from wild pollinators
squash	81%
tomatoes	18%
blueberries	10%
bell peppers	10%
watermelons	10%
peaches	9%
apples	9%
cucumbers	9%
cantaloupes	8%
soybeans	5%

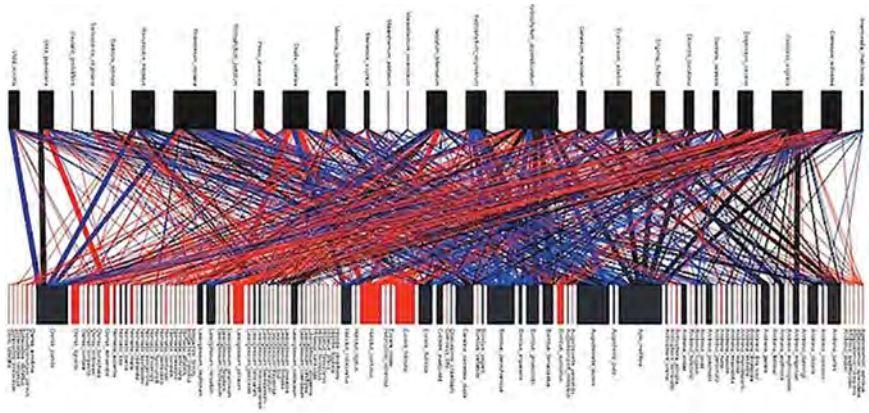
However, across the United States, "pollinator habitat is disappearing at rates usually reserved for descriptions of Amazon rain forest deforestation. This is most striking in the Midwest where more than 36,000 square miles of wetlands and prairie – an area larger than Indiana – has been converted to cropland since 2008."[1] Researchers compiled a graph showing the interdependence of pollinators and flowering plants in an Illinois forest fragment. The comparison graph shows a "dramatically shrunken web of relationships."[2]

The interaction network of flowering plants (top) and pollinators (bottom) in an Illinois forest fragment. *Black lines are relationships that have remained intact since the late 19th century; red and blue lines are relationships that have been lost. Image:* ***Burkle et al./Science http://www.wired.com/2014/05/wild-bee-and-butterfly-declines/***

*"We are losing 6,000 acres of potential monarch/pollinator habitat a day in the United States due to development (2.2 million acres per year). The losses of habitat due to the adoption of glyphosate tolerant corn and soybeans in the last 10 years amount to at least 100 million acres. The conversion of seven million acres of Conservation Reserve Program (CRP) land to crops for the production of biofuels adds to the total. In all, we estimate the loss of habitat to be 147 million acres since Monarch Watch was started in 1992 – an area four times the state of Illinois." (**www.monarchwatch.org**)*

Glyphosate (N-Phosphonomethyl glycine) is "the most widely used herbicide in the United States." About 100 million pounds are applied to U.S. farms and lawns every year, according to the EPA."[3] First registered for use in the U.S. in 1974, more than 750 products contain glyphosate for the "control of broadleaf weeds and grasses in: hay/pasture, soybeans, field corn; ornamentals, lawns, turf, forest plantings, greenhouses, rights-of-way."[4]

"The sodium salt form of glyphosate is used to regulate plant growth and ripen fruit."[5]



The interaction network of flowering plants (top) and pollinators (bottom) in an Illinois forest fragment. Black lines are relationships that have remained intact since the late 19th century; red and blue lines are relationships that have been lost. Image: Burkle et al./Science ***http://www.wired.com/2014/05/wild-bee-and-butterfly-declines/***

"About 100 million pounds of Glyphosate are used every year on America's farms and lawns."

EPA

"Glyphosate is a non-selective herbicide, meaning it will kill most plants. It prevents the plants from making certain proteins that are needed for plant growth. Glyphosate stops a specific enzyme pathway, the shikimic acid pathway. The shikimic acid pathway is found only in plants and some microorganisms."[6] This "pathway is found in bacteria, however, and humans depend on bacteria in the gastrointestinal (GI) tract to synthesize the essential amino acids."[7] Studies of chickens and cattle exposed to glyphosate "found that beneficial bacteria were susceptible, and harmful bacteria were resistant, to glyphosate."[8]

Researchers concluded glyphosate "disturbs the normal microbial community" predisposing chickens to Salmonella, and cattle to Clostridium botulinum.

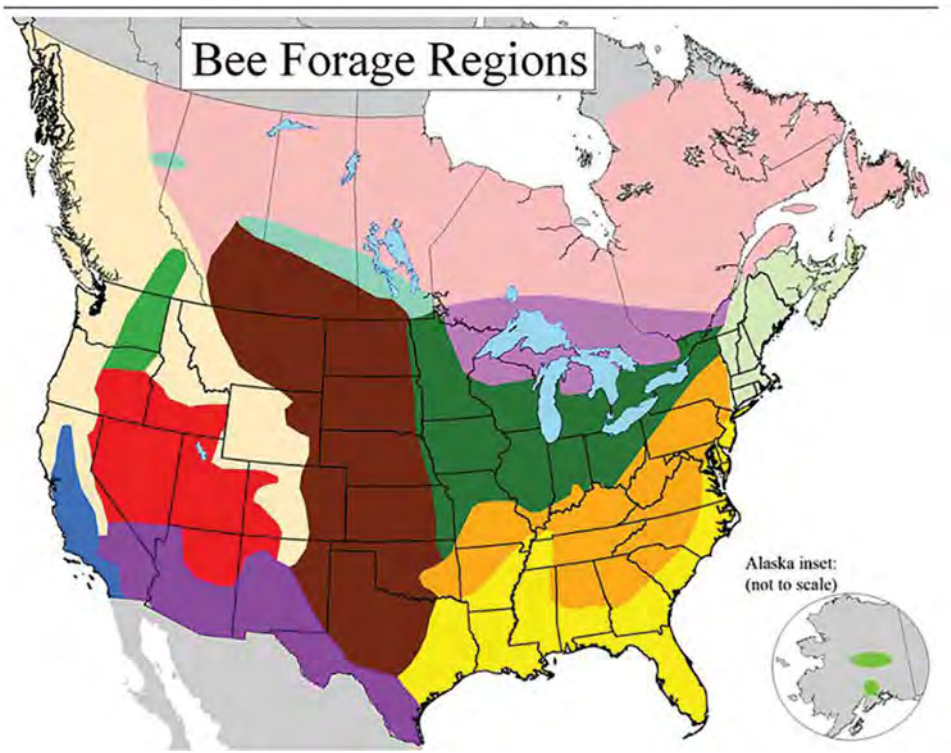
Due to the development of glyphosate resistant crops, the use of glyphosate has increased. Research has shown the residues of glyphosate "are found in the main foods of the Western diet."[9] The research reported in *Entropy* discusses glyphosate's "inhibition of cytochrome P450 (CYP) enzymes"[10] which play a crucial role in detoxifying xenobiotics. "Thus, glyphosate enhances the damaging effects of other food borne chemical residues and environmental toxins." "Its effects are insidious, because the long-term effects are often not immediately apparent."[11] "Glyphosate is likely to be pervasive in our food supply, and, contrary to being essentially nontoxic, it may in fact be the most biologically disruptive chemical in our environment."[12]

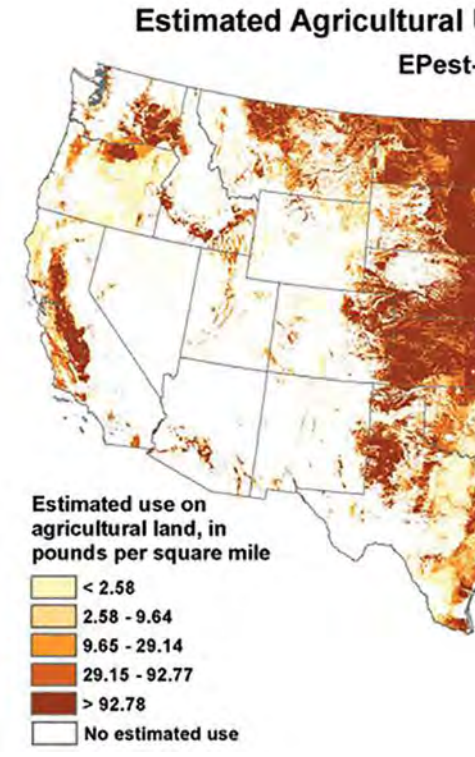
Glyphosate binds to the soil with a half-life of 47 to 174 days in soil and 70-84 days in water. "Another study found that some glyphosate was taken up by carrots and lettuce after the soil was treated with it."[13] Glyphosate is not just used to kill weeds, but "sprayed on crops to kill the foliage just before harvest."[14] This pre-harvest crop desiccation is used to even ripening, to harvest the crop sooner, for weed control in the next crop, and to reduce "green material in the harvest putting less strain on harvesting machinery."[15] A variety of crops may have pre-harvest desiccation applications including, cereals, sunflower, kiwi, raspberries, soy, and alfalfa to name a few.

"Most research has examined glyphosate alone, rather than combined" with the inert ingredients.[A] Inert ingredients are beginning to be defined as "other ingredients," as research is finding the inert ingredients are not the textbook definition of inert. ("not able to affect other chemicals when in contact with them: not chemically reactive"[16])

Scientists found inert ingredients with glyphosate "amplified the toxic effect on human cells – even at concentrations much more diluted than those used on farms and lawns."[17] One inert ingredient, polyethoxylated tallowamine (POEA), derived from animal fat, is a surfactant and used to aid the herbicide so it can "penetrate plants' surfaces, making the weed killer more effective." "POEA lowers water's surface tension-the property that makes water form droplets on most surfaces – which helps glyphosate disperse and penetrate the waxy surface of a plant."[18]

In one study the researchers studied "multiple concentrations" ranging from "the typical agricultural or lawn dose down to concentrations





100,000 times more dilute than the products sold on shelves. The researchers saw cell damage at all concentrations."[19]

"U.S. Geological Survey (USGS) scientists report that glyphosate, known commercially by many trade names, and its degradation product AMPA (aminomethyl phosphonic acid) are transported off-site from agricultural and urban sources and occur widely in the environment." The study summarized the "results of 3,732 environmental samples collected between 2001 and 2010 from 38 states."[20] ". . . the results indicate that glyphosate and AMPA frequently add to the chronic low-level exposures to mixtures of pesticides and pesticide degradation products that plants and animals experience in a wide range of ecosystems in the United States."[21]

"Glyphosate was detected in more than 50 percent of soil and sediment samples, and water samples from ditches and drains, precipitation, large rivers, and streams. Glyphosate was detected in less than 40 percent of water samples from lakes, ponds, wetlands. . . . AMPA was detected in more than 80 percent of wastewater treatment plant samples, while glyphosate was detected in only about 10 percent of those samples."[22] The researchers noted stated the AMPA and glyphosate "detection frequency, median concentrations"[23] increased the last four years of the study. Many studies continually showed "the occurrence of herbicides in streams, the degradates of the herbicide were more common than the parent compound."[24]

To meet national initiatives of increased pollinator forage, we can look to the lessons of the 1930s. The main lesson learned from the Dust Bowl was to "take care of the land." Conserving soil, and maintaining/increasing soil fertility was key to stopping erosion, and improving crop yields. After the Dust Bowl "government programs encouraged farmers to rotate crops and renew soil nutrients, to follow the contour of the land when plowing, to terrace sloping land to prevent erosion, and to plant rows of trees in "shelter belts" to slow wind erosion."[25] These "shelter belts" became habitats for pollinators providing diverse food, and helping to increase crop yields through increased pollination service provided by native bees. We can compare the maps of glyphosate use, bee forage, and monarch migration and examine how we are affecting the food supply of the managed and native pollinators who pollinate our food supply. Farmers, ranchers, beekeepers, and the non-farm public need to work together to "take care of the land." We can feed the world, but we must have the help of managed and native pollinators, and they need a healthy, diverse diet as well. BC

To meet national initiatives of increased pollinator forage, we can look to the lessons of the 1930s. The main lesson learned from the Dust Bowl was to "take care of the land."

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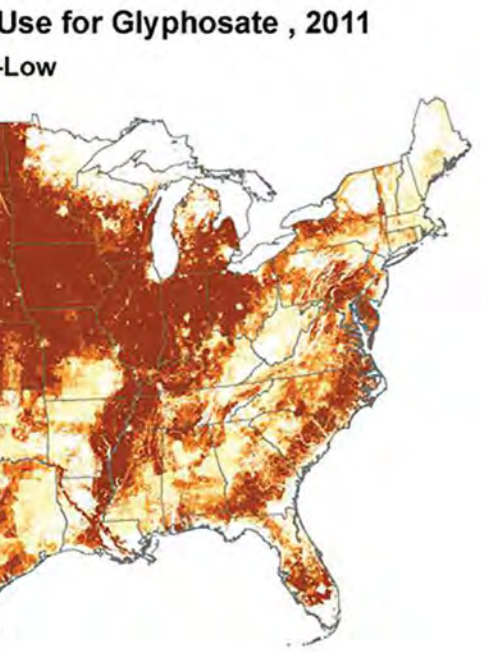

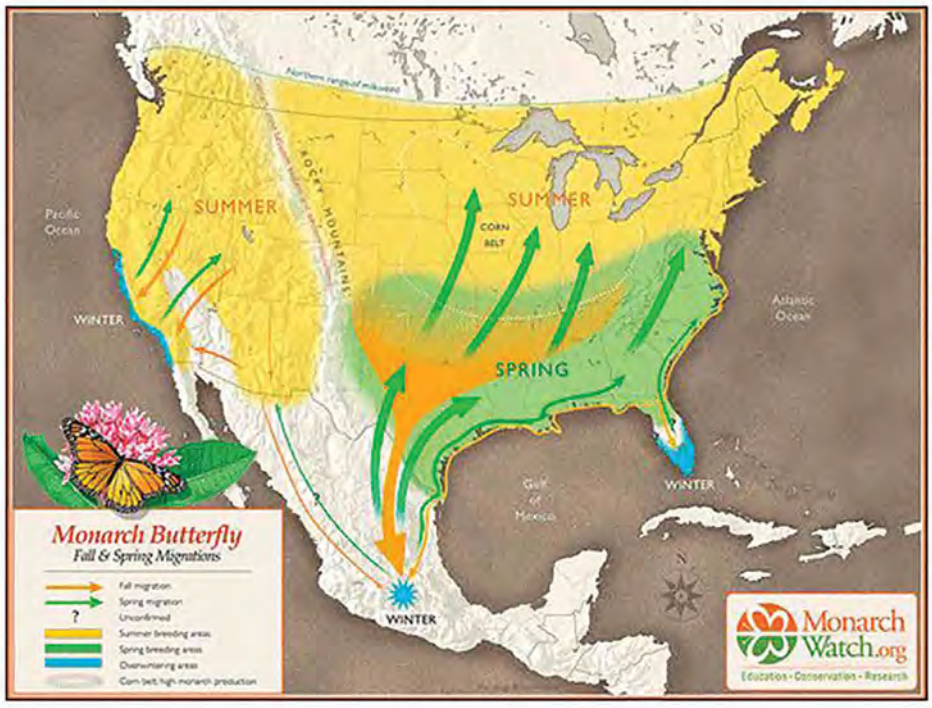

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[10] A **xenobiotic** is a foreign **chemical** substance found within an **organism** that is not normally naturally produced by or expected to be present within that organism. (**http://en.wikipedia.org/wiki/Xenobiotic**)

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Map of Glyphosate use in US **http://water.usgs.gov/nawqa/pnsp/usage/maps/show_map.**

Measuring The Environment and Watching The Honey Flow

Carmine **DeStefano**

"An integrated observational approach using satellite data and honey bee nectar flow data to determine the impacts of phenological shifts on honey bee health".

The practice and art of beekeeping is a tremendously rewarding experience that straddles natural history and ecosystem modeling activities. In the northeast part of the country beekeeping takes on several dimensions and the use of hive monitoring protocols is useful in understanding the health of bee colonies. Hive monitoring programs have exploded in recent years. For example, the *Sentinel Hive* project, the *CSI monitoring project* in the UK and *Hivetool* in North Carolina are some of these initiatives. These technology transfers give us important information, but relationships remain unexplored regarding the floral environment and a colony of honey bees. Expanding our knowledge base about these relationships can occur without implementing fancy and expensive equipment. Keen observation skills and phenological data tracking can tell us a lot about our world.

Many of the current monitoring programs are looking at weight changes and many internal factors that occur in the colony and this I think is useful information, but why stop there? The pre-eminent Eva Crane tells us that only about 16% of the plant life on the planet produces nectar and pollen resources that pollinators can exploit (Crane, 1990). But only about 1.6% is of keen interest to honeybees (Crane, 1990). This 1.6% of the floral environment produces the bulk of the world's honey crop. Environmental monitoring that is referenced with honey yields is one way to understand and explore the impacts our environment has on the floral opportunities that bees find important.

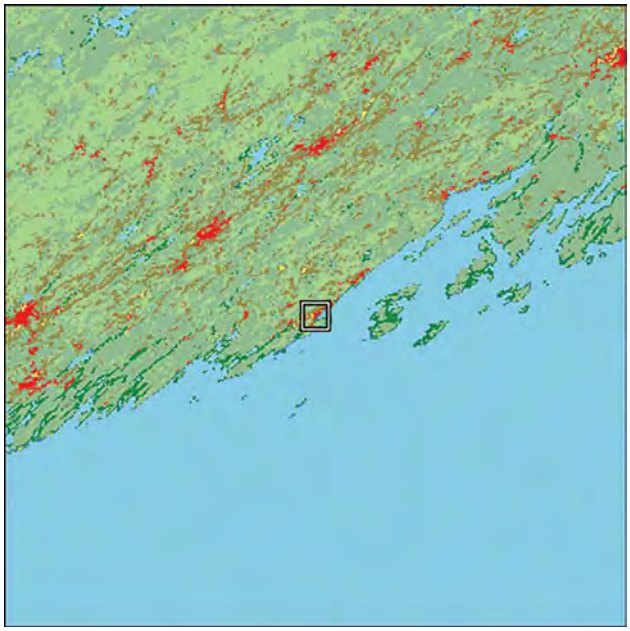
Nectar concentrations are very sensitive to ambient conditions. Heavy rains for example can wash nectar from many plant flowers. High humidity can easily evaporate water from the sucrose nectar solution and change the concentration of the nectar making it less available to pollinators (Nicholson, 2007). High doses of UV light can disrupt the protein development in pollen granules. Elevated CO_2 concentrations can change the general morphology of floral resources and also alter the concentration of particular amino acids in the nectar (Huang, 2010). Nectar and pollen resources are the fundamental building blocks for a healthy pollinator population, considering that pollinators are in decline worldwide looking more closely at the basic building blocks seems reasonable.

To illustrate how this complexity can shape pollinator syndromes lets look at two amino acids. *Proline* and *Phenylalanine* represent two amino acids that are of great importance to honey bee fitness. *Proline* is quickly metabolized by honey bees to produce accessible energy for flight and this amino acid can be more effective in producing short term energy burst than the normal glucose/ATP mechanism (Nicholson, 2007).

Phenylalanine is another amino acid and is ubiquitous in the bee-pollinated flora. We have known since Baker's work in the 1970s that environmental factors influence *proline, phenylalanine* and many other attributes of nectar chemistry. These particular amino acids most likely hold a high level of importance to bees, considering that these two amino acids are constituents of the honey bee hemolymph.

Floral environments are very complex places for bees to navigate. Flowers present nectar and pollen opportunities to pollinators at particular times during the flowers anthesis cycle. Anthesis cycles are greatly impacted by the ambient environment too. Sunny warm days support greater nectar secretions than dark cool days. For example, squash plants and almond flowers make their best nectar opportunities available early in their anthesis cycle, i.e., when the flower opens and is accessible for pollinators to exploit. Although the flower may be available and open all day on the trees or plant its nectar reward is highest for the first two or three hours after opening. The ambient conditions during this time affect the quality of that reward.

Many more research dollars should be allocated to study this topic further but in the meantime beekeepers have a wonderful



MODIS Vegetation pixel.

opportunity to collect data so an educated conversation can begin about this topic.

I have started a very small program in the Northeast where I keep bees that is collecting hive weight and assembling satellite vegetation profiles of the hive location while collecting ambient temperature, humidity CO_2 and UV data.

Nectar composition and concentration is a complex topic and understanding how the features of our ambient environment impact nectar and pollen is vital to our understanding of the plant pollinator relationship. The predominate factors that influence nectar/pollen development and quality is: *CO_2, UV-B light, water and temperature*. These environmental factors effect among other things the development of plant nectaries, anther development and pollen generation in many plants.

Many experiments that were conducted in the 1970s looked at the impacts that climate variables had on various plant species. Many of these experiments showed that CO_2, UV, temp and humidity affected the floral environment in ways that compromised the plant pollinator relationship. Expanding our monitoring envelope to include important floral development variables is an important first step in understanding the dynamic nature of honey bees in their environment.

I have designed a rudimentary protocol that beekeepers can implement in their apiaries that is cost effective and incredibility interesting. By setting one of your hives on a scale, this can be an electronic datalogger type of device or an old fashioned iron feed scale. Then taking weekly or daily weight measurements you can determine many qualities of your colony. Certainly swarms, forager dispatches, but one important feature in terms of this protocol is precise honey yield at the end of the season.

Next understanding the vegetation of the hive location is important in determining the presence of forage, satellite vegetation profiles generated by the MODIS instrument that flies aboard the Aqua and Landsat 7 satellites is a great tool for this. The following link allows you to put in your hives (*lat/long*) information and will generate a data product for you. This product can take a few days to receive and is good for about 30 days: **http://daac.ornl.gov/cgibin/MODIS/GLBVIZ_1_Glb/modis_subset_order_global_col5.pl**

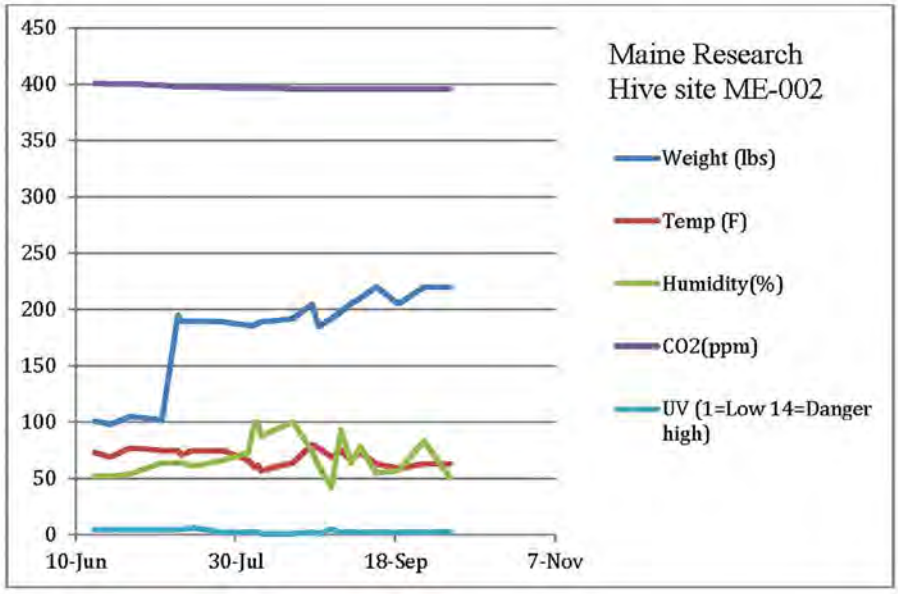
This satellite data is housed at the Oak Ridge National Laboratory DACC in Tennessee and is a free service.

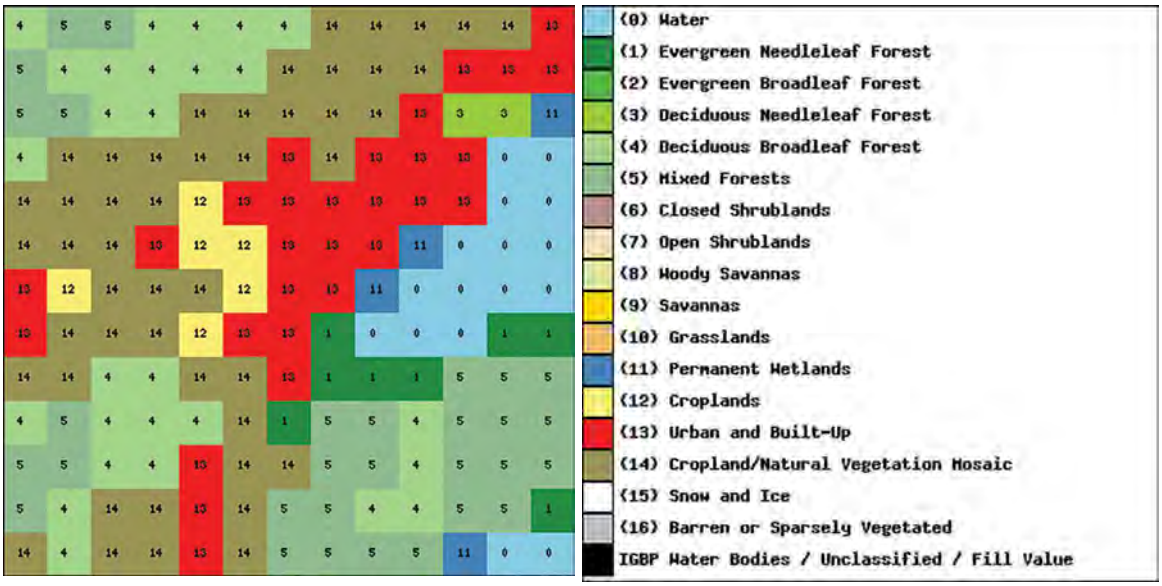
You will need general CO_2 data information and many options are available for this on the internet, however, the NOAA-ESRL site is a valuable resource for this: **http://www.esrl.noaa.gov/gmd/dv/data/index.php?site=amt**

Many places in the country have remote automated CO_2 sites located on towers. This site information is a bit more cumbersome to work with so it is best to first determine if a remote CO_2 tower exists near your, otherwise implementing the following site which is easier and has the Mauna Loa data which will work too. Both of these sites are free: **http://www.esrl.noaa.gov/gmd/ccgg/trends/weekly.html**

Keep in mind that CO_2 data is usually collected weekly and if you do have a local tower near you that data can be delayed for up to two years for processing. Carbon dioxide data is also highly variable depending on your location and the weather of the day, so this is just baseline data that can later show correlations but is not fine enough to really rest a thesis on.

UV data can be found at TEMIS: **http://www.temis.nl/uvradiation/SCIA/stations_uv.html** stations are located worldwide which makes this aspect of the data collection a bit





6.25 x 6.25 vegetation pixel and pixel key

easier, you can use the EPA SunWise site too. Just keep in mind the scales are slightly different so pick one service for the sake of consistency. Like CO_2 data UV data is highly variable, cloud cover, elevation and the like all affect UV at the surface.

Lastly, temperature and humidity data are easy to collect from your local weather service or regional airport. The closer the sensors are to your hive location the better of course.

By implementing this protocol and collecting weight, temp, humidity, UV and CO_2 data research hive sites can generate a nice Excel spreadsheet. This data set can then be used and referenced for policies and scientific inquiry. Any beekeeper can participate and implement this protocol in their beekeeping activities. It provides a wonderful educational tool for understanding the complex dynamics and environmental feedbacks that honey bees reside in. Local bee clubs and university extension programs can utilize this protocol and develop their own databases. Additionally, this data can be shared or integrated into the larger monitoring programs that already exist.

The application of modern technology to monitor our world has grown exponentially. We have satellite technology that can monitor vegetation profiles and sensors placed over the globe that monitor CO_2 and UV and a host of other variables. It would be nice if the beekeeping community began tracking these variables and correlated them to honey production.

This data will support a fundamental thesis of this project, that environmental variable such as: CO_2, temperature, humidity and UV-B impact plant nectar and protein profiles. Compromised food sources contribute to honey bee mortality by supporting general nutritional duress for the bee population. Understanding how environmental parameters degrade or otherwise compromise the nutritional attributes of common bee forage has useful implications for the agricultural community and beekeepers alike.

To visualize the essence of this project think of a plot one meter squared. If you were to stand in the middle of this square and extend your arms your fingertips would be outside this hypothetical plot. Now, lets broadcast a variety of seed and wait. In our hypothetical plot let's assume one thousand plants sprouted and grew to maturity. Of the one thousand plants only one-hundred-sixty if them will be entomophillic plants, or plants that are pollinated by insects. The remainder will be anemophilous, or wind pollinated plants such as grasses. Honey bees exhibit preferences when foraging, only 1.6% of nectar producing plants are of interest to honey bees as referenced by honey yield. Thus, our hypothetical meter squared plot of 1,000 plants contains 16 plants that honey bees rely on for most of their dietary needs; they will visit other plants because they are opportunist by nature but 16 plants they really prefer. Now if we were to enclose this plot and increase the temperature, humidity or CO_2, what do you think the response would be? What if we changed UV light or any combination of these variables? Could we accomplish this without incident to the floral environment? Is it possible to change the variables without impacting those sixteen flowering plants? The literature on the matter indicates we cannot!

It seems easy to become bewildered in the honey bee decline debate but without some comprehensive data it is difficult to determine if pesticides, habitat loss or nutritional duress are to blame for this. Wonderful monitoring programs already are producing data and my hope here is not to further fragment the data horizon but to broaden its scope to capture data points that really influence the floral environment that bees are sensitive to. BC

Carmine DeStefano is a graduate student at Harvard Univ, an avid beekeeper of 10 hives located on the coast of ME and can be reached at ***carmine.destefano@gmail.com****.*

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PHENOLOGY
And Its Value To
BEEKEEPERS

Denise **Ellsworth**

Spring can be slow to arrive to Ohio. Here in the Buckeye state, the days of March are usually full of gray skies and partially frozen soils, with only hints here and there of warmer days to come. Silver maple and speckled alder are two of the first trees to bloom, both with subtle flowers eagerly visited by honey bees ready to start the season. Gradually Spring color splinters the gray hues, and Spring arrives.

The yellow flowers of the forsythia shrub are a sure sign of spring in Ohio. Forsythia is a fairly modern addition to our landscapes; most commonly-grown species were introduced from Asia in the mid-1900s. Several plants native to North America also serve as harbingers of Spring, including the wetland-loving skunk cabbage, spring beauty wildflowers and the lovely white-blooming serviceberry tree – all visited by honey bees in need of pollen and nectar to build the Spring colony.

Serviceberry's name tells of this plant's importance as an indicator of Spring. Sometimes called sarvis-berry or simply 'sarvis,' the serviceberry (*Amelanchier* spp.) earned this common name because its time of bloom coincides with the thawing of cold Winter soils. In times past, funeral services could be held for those who died over the Winter once serviceberry bloomed; soils would be thawed enough to allow for burial.

Serviceberry's other common names, Juneberry and shadblow, also speak to the tree's role as a phenological indicator. Phenology is the study of recurring biological events, such as bloom time, animal migration and insect emergence. These events follow the same sequence from year to year, regardless of the speed at which the events unfold. The common name shadblow comes from the coincidence of bloom time with the swimming of shad upstream to spawn in spring; the name Juneberry describes the ripening of the fruit in early Summer.

Serviceberry.

The seasonal appearance of flowers and insects are examples of phenological events that have been recorded for centuries. Because the development of both plants and insects is temperature dependent, plants can accurately track the environmental factors that determine when insects are active. For this reason, plant phenology can be used to predict insect activity. Plant phenology can also be used to track long-term climactic changes, such as global climate change.

Using the principles of phenology, Dr. Dan Herms, professor of entomology at The Ohio State University, created an extensive biological calendar based on years of observation of plant and insect activity at Ohio Agricultural Research and Development Center's Secrest Arboretum in Wooster, Ohio (find calendar here: **http://www.oardc.ohio-state.edu/gdd/**). Several times a week between 1997 and 2004, Dan walked through the arboretum, monitoring the phenology of 91 ornamental plant species and/or cultivars, and 43 key insect and mite pest species.

This intensive, long-term research project has demonstrated that phenological events occur in virtually the same order each year. By entering an Ohio zip code, visitors to the Ohio State Phenology Calendar website can acurately pinpoint development events in their region in Ohio. The biological calendar is used extensively by extension personnel, pest managers and horticulture professionals to monitor plant development events, predict pest activity and schedule pest management appointments.

To expand on the phenology calendar, Dan and I developed the Ohio State Phenology Garden Network in 2004. At 36 gardens located throughout Ohio, project volunteers planted identical plant material consisting of 17 common trees and shrubs and 15 perennials, the blooming sequence of which spans the growing season. The Network is a collaborative research and education effort that involves numerous Ohio State Master Gardener programs, local parks, schools, arboreta, and

other partners, including the grounds of *Bee Culture* magazine's headquarters in Medina, Ohio. At each site, volunteer citizen scientists engage in the age-old practice of tracking plant bloom and linking these phenological events with insect pest activities, as well as using the gardens as demonstration and teaching tools for gardeners and professional horticulturists.

In 2012, I changed positions with Ohio State University from a county extension educator to the program director of the honey bee and native pollinator education program, housed within the OSU Department of Entomology. To reflect this change in focus, we added 11 pollinator-attractive native perennials to 28 of our phenology network gardens. Beginning this Spring, our volunteers will track the span of bloom and pollinator visitation on all network garden plants. These data will paint a picture of which plants are visited by which pollinators, and how bloom times overlap to provide forage across the growing season.

While many plant lists exist to help beekeepers, gardeners and farmers to select plants important to honey bees and other pollinators, most of these lists include information about the timing of bloom using calendar dates (April – May, for example), if at all. As any Midwesterner who travels south in Spring knows, April in central Michigan is a world away from April in northern Kentucky or southern Virginia, making the calendar-based information almost useless. By linking time of bloom to Growing Degree Day units (or GDD, a measure of accumulated heat), the bloom timing and sequence can be interpreted across a wider region. Growers hoping to span the Spring and Summer with a sequence of bee-friendly forage plants will be better able to select suitable plants.

From a practical perspective, Ohio beekeepers have been excited to use Ohio State's phenology calendar to help them prepare for specific bloom events. Because the calendar can show which plants are flowering in a specific region of the state and which are coming into bloom soon, beekeepers can be ready to add honey supers before black locust comes into bloom, for example. This is also helpful for beekeepers who manage bees at multiple locations across the state – areas that may have significant variation in bloom progression. One clever Ohio beekeeper has tracked plant phenology and correlated this to his hive management practices, such as swarm week (correlated with bloom of daisy fleabane), time to raise queens (dogwood bloom), and time to create nucs (chicory in bloom).

Another practical application of the calendar pertains to the prediction of plant pest activity. Horticultural and pest management professionals in Ohio have used the phenology calendar for over a decade to help refine the timing of pest management strategies, such as pest monitoring and pesticide application. Pesticide and other pest management recommendations from OSU Extension previously relied on calendar dates in order to time applications. Because phenological phases in the state can vary by three weeks or more from Cincinnati in the south to Cleveland in the north, recommending a pesticide application in "early May" could be costly and useless, since the pest may be past its most susceptible stage or not yet susceptible in the far reaches of the state. Using plant and pest phenology to time management strategies refines the timing and improves pest management results.

Eastern tent cat webbing.

Since many beekeepers are also farmers, gardeners or land managers, the phenology calendar is useful to give a heads-up to specific pest activity. When border forsythia first comes into bloom, for example, Eastern tent caterpillar eggs begin to hatch. These caterpillars can damage fruit trees by feeding on early foliage. Once alerted to the timing of egg hatch, apple growers can monitor trees for signs of the pest's webbing in the crotches of tree branches. These early webs can be easily removed and destroyed with a gloved hand before leaf damage occurs, eliminating the need for pesticide applications. Other plant/pest indicators include full bloom of lilac and hatch of pine needle scale, full bloom of arrowwood viburnum and bagworm egg hatch, and first bloom of 'June Bride' littleleaf linden and Japanese beetle adult emergence.

Residents of states that border Ohio can make use of the Ohio State Phenology Calendar by entering an Ohio zip code from a geographically similar area. Additionally, other states are conducting similar research to track plant and insect phenology, although we have yet to locate a resource as comprehensive as Ohio's calendar. Still, curious beekeepers and naturalists can make use of the principles of phenology to create a biological calendar by tracking bloom events and insect activity in their own locality throughout the growing season. Maybe the serviceberry's bloom this spring will provide a phenological reminder to grab a notebook and pen and begin to take notes on the sequence of biological events near you.

Learn more about phenology and Ohio State's phenology research at: **go.osu.edu/phenology**. BC

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BOB KOEHNEN

A CALIFORNIA BEE BREEDER AND INVENTER
100 Years Of Apiaries & Orchards

M.E.A. **McNeil**

The cars rolled up California 162 and Ord Ferry Road, merging into a long, slow caravan on Highway 45 through nut tree and bee breeding country, turning in at the sign of the skep reading C.F. Koehnen and Sons. They rolled past low buildings, past orange trees laden with fruit in December, past yards of cell builders and queen boxes, past nut harvesting machinery. The envoy had come to honor the memory of Bob Koehnen. If you had known him you might have thought how pleased he would have been with the crisply straight rows that his employees waved the cars into – row after row. But for him? No, not so much; he was not a center-stage kind of guy. Nonetheless, nearly 500 people filed into a warehouse transformed for his memorial to a man who once presided here.

Presided would not be the right word for his tenure; he was, by all accounts, a man generous of spirit who did not hold himself above those he worked with. But he was a guide, a tenacious organizer – down to the minute or the last screw.

Clues to his well-lived life can be gleaned from his obituaries: He served on the board of the California State Beekeepers Association and was both a CSBA Beekeeper of the Year and Lifetime Honorary Beekeeper. He was a 50-year member of the California Bee Breeders Association and The American Beekeeping Federation. He initiated a program to reward convictions for beehive theft or vandalism and a service to alert beekeepers to pending pesticide spray applications. He loved classic cars and a collection of Harleys, on display at the memorial.

But there are values beyond those facts that have sustained a rarity – a four-generation enterprise in the same location for over 100 years. “There are a million ways for a family business to fall apart,” said Bob’s son Kalin Koehnen. He oversees their almond and walnut orchards, son Kamron the bees, and his brother Bill’s son Mike the business office and nut processing facility.

So why, if so few family farms survive, has this one flourished, drawing in each new generation? One element may be an influence of character: Cobey describes Bob as “quiet and mild-mannered. I never heard him raise his voice.” Eric Mussen, emeritus extension specialist at UC Davis, calls him “a gentleman.” Another sustaining legacy may be Bob’s principles: tenacity, respect and community.

These values remain evident

Bob Koehnen with his brother Bill, left to right, stand on their nut huller with the next generation in charge of their beekeeping and orchard business, Bill's son Mike and Bob's sons Kalin and Kameron. (photo courtesy of Yvonne Koehnen)

within the operation. Although conflict between orchardists and beekeepers is legion, "We can tiptoe around applications and do what is most beneficial to both," said Kalin. "There is no advantage to us to make any decisions that would be detrimental to bees. It's kind of obvious. We treat each other the way we want to be treated, and the way we treat others."

It's a lesson to be heeded. Bob and later his son Kamron each tried migratory beekeeping one time for pollination, and each returned less than glad for the effects on the bees. Since then, with the exception of an isolated mountain mating yard, they have kept their bees in a 30 mile radius where there is a "gentleman's agreement" with regard to respect for the presence of pollinators.

The family story illustrates the history of commercial beekeeping in California from 1907. Carl Fredrick Koehnen, and his brother Albert were born in San Diego to German immigrant parents. The brothers, whose catfishing business was stymied by the closure of the San Joaquin River to commercial catfishing, found a new occupation when they tasted some honey they received in trade for fish. They soon got some beehives to produce their own sweet gold, branching from Tracy to Live Oak and then further north to Ord Bend, where Carl settled.

C.F.'s venturesome spirit was matched in the young Anna Kalin, who, at 19, had migrated alone from Switzerland. They married in 1928 and that year bought 20 acres in the Sacramento Valley near Ord Bend. Then, bee forage was abundant: wildflowers grew in wide swaths and vast grain fields turned yellow with star thistle after harvest. The young couple built their home and a warehouse that is still in use at the company headquarters.

Originally, C.F. was in the bee business for honey production, packages, and queens. But honey harvests declined as open land and wheat fields were consumed by orchards with a short bloom time. C.F shifted his focus to queen breeding, sending almost all of his packages and queens to Canada, where, at that time, colonies needed to be replenished each year because they were not overwintered.

C.F. and Anna's two sons, Bill and Bob, eventually ran Koehnen Apiaries. Bob was the younger brother; he went to Ord Grammar School and Hamilton City High School in the next town. At 16, he became a legal partner in the business, with his dad and brother, under the name still used today, Koehnen & Sons, Inc. He attended the University of California at Davis, studying pomology – although he had developed a passion for bees and skipped a semester each year to rear queens by April 1. Drafted into the Army in 1957, he saved up leave time to make it back for the queen season. "All the stories come back to getting here for grafting," recalled Kamron.

In 1962, Bob married Yvonne Millar of nearby Glenn, who said, "I always knew there were some Koehnen boys up the road." She, too, worked in the business as they raised their two sons – "at the heart of it with Bob," said commercial beekeeper Pat Heitkam.

C.F., remembered by Yvonne as "a wonderful man," died in 1978, not living to witness the disaster that struck the Northern California bee breeding market. The Canadian border was closed to bee imports in 1987, in a vain attempt to prevent the spread of tracheal mite. Many Northern California package bee and queen producers, located there to be as far north as possible to service Canada, simply folded. The Koehnens were among those that survived by turning to the domestic and international markets. They also expanded into growing nuts, which they'd grown since 1955.

Bob Koehnen was known as an innovative agriculturalist. Marla Spivak of the University of Minnesota called him "inspired – unique in that he was an inventor who strove to make bee management more efficient."

"He works it like a clock," said Washington State University bee breeder Sue Cobey, whose first job working with bees was with Koehnens. "He didn't veer from the routine of the system . . . There

The memorial for Bob Koehnen last December brought nearly 500 people together to celebrate a life well lived. Bob's classic truck is in the back left corner, and his motorcycle collection was on display as well. (photo by M.E.A. mcNeil)

is so much detail, it can go wrong fast – just a couple of degrees in the incubator."

He perfected an assembly-line system for making up queen-mating nuclei, synchronizing each step of an impressively large operation. Entering the premises, a visitor sees on one side of the drive dozens of hives with breeder queens, tended by Manuel Gomez. The brood boxes are sectioned off into four compartments, two of which are filled with small frames and one of the two confining the mother queen. Each frame with three day old larvae is pulled and carefully hand carried by a runner, Roberto Villalobos, to a pair of deft grafters, Josephine Rodriguez and Esmeralda Romo.

Each grafted frame holds 60 queen cells, and the accuracy of the grafters is high. The frames of new grafts are hand delivered to the other side of the drive and placed in highly populous cell starter/finishers: These are cell builders that are queenless colonies packed to swarm conditions to prompt the workers to draw out the queen cells. These colonies are continually fed syrup with top cans.

Each frame is timed to be removed from the cell builder to an incubator, and just before the queens emerge, the cells are cut apart with a unique mechanism. Then, each cell is placed into a mini-nuc queued up on a conveyor belt. The boxes are moved down the belt in an assembly line in operation every morning for three weeks. A ripe queen cell is skillfully pressed into a nuc frame, which has been lightly touched with a propane torch to melt the wax just enough for the pupating queen to be fastened to a comb. The syrup can is filled, and the conveyor belt moves the nuc through flaps covering a wall opening into a darkened room on the other side.

There, bulk bees, shaken from the yards and misted to reduce flight, are scooped into each mini-nuc with a wood-handled Spam can, which measures four ounces of bees. A third frame is added and the box is closed. The nucs are stacked six high in the cool and carefully ventilated room. The bees take up the syrup and the virgin queens soon emerge to settle in with the workers.

On the third morning, the three-day-old nucs are loaded on flatbed trucks and set out in mating yards, each with drawn comb, stored feed, a cohesive group of bees, and a newly emerged virgin queen. Once in the field, the entrance is opened, and the bees are allowed to fly. Timing starts for mating flights and for the queen to begin laying – unless there is a weather delay. When a laying queen is harvested, the mini-nuc remains in the field for another queen cell to be added.

The four-man nuc crew is headed by Raul Cardenas. He arrives at 3:30 am and by 7:30 am he has fed 3000 baby nucs. The process requires an intense 95 days, seven days a week for the queen rearing season, during which 100,000 queens are produced. By June, the work winds down and the nucs are brought out of the yards to be cleaned, wrapped in plastic and stored on pallets for the next season. The entire ranch is notably orderly, a sign of the clear intention with which it is run.

The company employs workers year-round. Kalin Koehnen said of the policy, "The beauty of it is that the bees are six months out of phase with the nut harvest, so the same crew both harvests and works the bees. We rarely hire seasonal help. It takes a year to train a person, so it matters to have longtime workers." Most have been with the company 20 years or longer, sharing a comradery that Bob valued. Josephine Rodriguez, who grafts, walked in eighth grade graduation with Kalin.

"He could have 10 employees around him visiting. The money wasn't his main goal. He enjoyed people," said Galen Jantzen, who worked with him in the shop. The Koehnens celebrated with their extended community at a 100-year anniversary party in 2007, that, Kalin said "eight years later people are still talking about." At a sit-down dinner for 1200 people, they toasted their grandmother Anna, who herself was about to turn 100, as well as their late grandfather, Bob and Bill. Guests danced until the night ended with a fireworks show.

After a day of requeening, bees cling to the pocket where Bob Koehnen was carrying queen cages. He was known as a hands-on manager, working with his crews to keep track of details. (photo courtesy of Yvonne Koehnen)

For anyone who wanted to see their queen-rearing process, Bob Koehnen generously shared his expertise. Some wondered at his willingness to show his breeding operation willingly, since techniques he'd devised by trial and error could easily be copied. But Bob maintained that he had formulated his way of rearing bees and queens from the

This unique forklift, designed by Bob Koehnen, has double forks, making it possible to move two pallets at a time. It is one of many of his inventions for mechanizing his operation. (photo courtesy of Yvonne Koehnen)

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experience of many and said, "I don't mind being a good copier." And anyone touring their place at the height of the season could take away everything but the determined hard work, focus on detail and intuition that he imbued in every step.

"He was incredibly hard-working," said Heitkam, who recalled seeing him running his Caterpillar, hauling hives in his truck, and shaking bees in a downpour.

Kamron Koehnen recalled, "My dad would move bees in the morning, shake bees in the daytime and graft in the afternoon, before the grafters were hired. He'd work bees all day and then spend time in the shop. I remember going on family bee moves in the evening: At six, my brother was eight, we kids would gather up the cans before my dad could pick up the pallets with the forklift."

Cobey remembers Bob saying, "You never can stop when you get the ball rolling. You've got to do it now. It's a process of detail – so many little things." What made his system work, she said, is that he would go out with his crews, working alongside them and keeping track of minutia.

When she took a job at Koehnen, she recalled, she was just out of a beekeeping class taught by Mike Burkett at Oregon State. "It was a shock jumping into a full-scale operation – Bob was one of those special people who influenced me as a young girl wanting to learn about bees, giving me an opportunity to try things I sometimes doubted I could do" – often testing her limits. As a member of the crew, "they will go all out for you. He valued people and treated them well." She remembers Bob showing up with oranges or cakes that Yvonne had baked.

Years later, Bob welcomed Cobey's classes from U.C. Davis to visit. In earlier years, she had compared various queen-rearing systems with Harry Laidlaw. They found that Koehnen's was unique because the cell builders are very strong and house different age groups, with the position of the frame signifying the age. "It's a very good system," she said.

Bob charted the process carefully. Spivak said, "Everyone who saw his queen rearing schedule tacked to the wall of the grafting building (which was the equivalent in complexity and organization to the Periodic Table of Elements in chemistry) knew that Bob's management style and expectations were on a higher level, even sublime." The chart noted subspecies of bee, position of frame of eggs pulled, grafting time and date, grafter's name, temperature, weather conditions, number of cells, number and location of nuc, cells finished/started, feeding date and location. He was mindful of how each of these elements affected the catch.

California mini queen cages remain a standard in the industry. Bob Koehnen developed them as well as designing a machine for their manufacture. (photo courtesy of Yvonne Koehnen)

Cobey notes that Bob liked to select bees for a cordovan color, a chocolate-burgandy hue that is a recessive trait found first at the Baton Rouge lab some 75 years ago. His Carniolans, which make up a third of the stock, are bred in an isolated mountain apiary with dark drones. The Italians are from queens instrumentally inseminated by Cobey.

Bob Koehnen's fingerprints are on every aspect of the operation. For example, to increase quality and acceptance, he dipped his own queen cups from cappings wax on site. He devised an early machine to fill syrup into package feeding cans automatically.

The California mini queen cage, which remains a standard, was developed by Bob 20 years ago. He observed that queens did well without attendants inside the cage and that a smaller cage could leave frames closer together when inserted for introduction. He made prototypes on the lathe and redesigned them to his satisfaction. He found the smaller cages easier to carry in his pocket and, since more fit into a packing box, they cost less to ship.

Together with beekeeper Darrell Wenner, Bob had already developed the larger Wen-Koe queen cages. They were built with a machine, commissioned from an engineer, that adapted a technology from door construction to apply the screens.

When Galen Jantzen was hired to work in the shop in 1974, he helped Bob build out his visions. In the early 90s Jantzen built a production machine for the mini cages. Their device feeds in a long piece of wood, routs it, drills the end, and cuts it; wire screen is cut from a roll and staples are made by the machine out of wire as it shoots them in. The company has been producing queen cages for 45 years and now ships 1.25 million mini cages annually throughout the US.

Prototypes of various sizes of shipping boxes, inspired by the Rossman container, were built by Yvonne Koehnen to fit the new cages. She found that 160 small cages fit into a box that previously held 104 larger cages.

The one-inch black candy-filled tube sold with the cages was the product of experimentation to determine a length and recipe for the bees to eat through in 2½ days, which, Bob Koehnen concluded, would allow enough time for the queen's pheromone to spread enough to make her welcome. A second-hand commercial dough mixer is used for making the candy, and the tubes are packed upright in ammo boxes, just the size to be filled 100 at a time with a machine developed by Koehnen and Jantzen. The tubes are set aside for several months for the candy to cure properly.

An ingenious mechanism for cutting queen cells apart when they come out of the cell builder was

created by Bob Koehnen with Jantzen in the early 80s. Cobey calls it "unique worldwide. Everyone else does it by hand. It's pretty impressive." The machine cuts between 15 cells on each bar and cuts the cells off the bar before they are taken to the nuc assembly line.

Another of Bob Koehnen's inventions is a towable bee-moving forklift with four forks, able to move four pallets of colonies at one time, then spread the pallets apart. His son Kalin said that they can move 1000 colonies a day with the double forklift.

His inventions for the orchards, created with Jantzen, are many, including the development of the bankout unloading cart system for harvesting almonds and walnuts. It has a conveyer that unloads onto another vehicle without stopping, reducing time in the field.

Not every innovation was successful, Jantzen remembers, like an experimental large smoker. But, he said, "His heart was in the shop. He wanted to get his hands dirty. It was fun to work with him. He was so humble, sometimes it was like I was the boss and he was the worker. But he came up with the ideas. And he had way more ideas than we could do."

Kalin said of his father, "No matter how bad, how tough things got, he'd always have a plan. We were always going to get through whatever. All of us, all the people who work for him, knew we were going to see the job through. I credit him with a lot of instinct that I have and the direction to go. He loved the trees, but his first love was bees. He and Bill are beekeepers at heart."

Cobey remembers that one very rainy year Bob said that "some years are like this, and we just continue to do the best we can to stay on schedule, regardless – a simple, very wise, lesson in life."

Kalin said that the family members running the business stay closely in touch, "keeping it real and live every day. We talk so often that communication stays open. We are three equals. We trust one another. We know that we are fortunate." The business now includes Mike's sons Steven and Kamron's son Reed, the fourth generation.

Bob's legacy to his family is apparent. But we can all learn something from this life well lived – not necessarily to emulate the specifics, for surely there are as many ways to keep bees as there are beekeepers, but to know that calm kindness, respect, inventiveness, attention to detail and hard work are fruitful, attractive attributes.

For three months mini nucs are assembled at Koehnen & Sons on an assembly line and then stored in this climate controlled room for three days until queens emerge. (photo courtesy of Yvonne Koehnen)

"Bob Koehnen was an inspiration to many aspiring beekeepers," said Heitkam. "His work ethic was unmatched. His mechanical and design ability, along with his quest for efficiency, set a high bar for the queen and package industry. Bob, together with his wife Yvonne contributed massively to our important industry."

His son Kamron called him "the perfect ambassador." BC

Contributions in honor of Bob Koehnen will be used toward the building of a beekeeping museum on the grounds of the Patrick Ranch Museum in rural Chico, and may be sent to: Bee Museum Fund – Robert Koehnen Memorial, Patrick Ranch Museum, 10381 Midway, Durham, CA, 95938.

M.E.A. McNeil is a journalist, Master Beekeeper and farmer living in California. You can reach her at: mea@onthefarm.com.

Bob Koehnen's sons Kamron and Kalin, left to right, on either side of him, now run the family apiaries and orchards with their cousin Mike. (photo courtesy of Yvonne Koehnen)

BIGGER PICTURE

Jessica **Louque**

Pretty & Practical – A yard that's attractive and productive

If you've ever lived in a small town, suburb, or rural area, you know that people *talk*. Neighbors will question your every landscape, gardening, and sometimes beekeeping, move. We have an unsightly refrigerator on the front porch from a recent (or not so recent) appliance swap and haven't had time to move it. I had a neighbor call and offer to buy it just to get it out of their sight. Keep in mind here, we live about a quarter mile off the highway and there are only three houses on this dirt road. Sometimes, it's worth it to pick a fight with your neighbors, and sometimes a little appeasement goes a long way.

Assuming you are keeping bees and have neighbors nearby, chances are you've already upset someone. I have at least one neighbor that swears he will go into anaphylactic shock if he is stung by even one bee. I will give him the benefit of a doubt because he does carry an epipen, but having him calling me before 8am on a Saturday because there are "swarms" of bees on his hummingbird feeders is not the way to start a weekend. Some of your locals prefer to not even know you have bees, and a few will either not mind or even be happy about the extra garden pollination – but there's always THAT neighbor. In this case, the best scenario is to figure out how to do what you want while causing the least amount of confrontations.

I like to plant things everywhere. It's probably a good thing that the soil is atrocious here or there might be a jungle outside. I used to tediously attend to the needs of all the plants, prior to the acquisition of stepchildren. Now I have a lot less strict idea of what's "absolutely necessary" for yard maintenance, while the need for growing food has risen. Personally, I've never met an ugly garden, but we all know that beauty is in the eye of the beholder. I like the addition of color to the front of the house from the chalk murals, and I think the broken picnic table with bullet holes and paintball splatters adds character to the yard, much like a statue or fountain. Some people may call this unsightly. Sometimes I think both my neighbors and I are waiting impatiently for the orchard trees or crepe myrtles to grow high enough to block out the yard. Not everyone is going to upset their neighbors quite like I do (wait until your neighbors think you're keeping a bobcat because they hear your peacock) but everyone can benefit from pre-planning your plantings.

I'm going to focus on the front yard, because that's normally the main area of scrutiny from surrounding people. A lot of you have a grassy spot in the front yard. I think grass is a waste of gardening space and of lawnmower gas, and a breeding ground for grubs. Slowly the grass is disappearing. More attention to detail will have to be applied to this gardening endeavor to keep it visually appealing as well as beneficial to you and your family (don't we all count bees as family?). If you can make an attractive garden that has various points of interest and usefulness, it's much easier to strike up a positive conversation that can also add a good spin to the beekeeper's heinous hives.

When you are looking to plant up your yard, there are several things to consider. It's nice to have pretty flowers, but why have something that's only pretty? You should pick plants that can offer at least two benefits from being in your yard. Make them pay you for your hard work with something other than visual appeal. For example, Bachelor's Button is pretty, bees like it, and it's edible. Depending on your level of expertise, you might also want to keep up with what will be pretty the longest, unless you want to do some sort of succession planting. You can also do a mix of annuals and perennials so that part of the work is already done for the upcoming years.

If you are past the novice stage of gardening, you may want to try your hand at espaliered fruit trees. I took a class in permaculture in grad school where the professor used his house as an example of small things that make a big difference. His front "picket fence" was criss-crossed apple trees that had grown together in a lattice design. One of our field trips uncovered an entire backyard fenced in by espaliered apple trees. Not only is it unusual and eye-catching, but it's also a fruit producer. Who doesn't want a blooming fence?

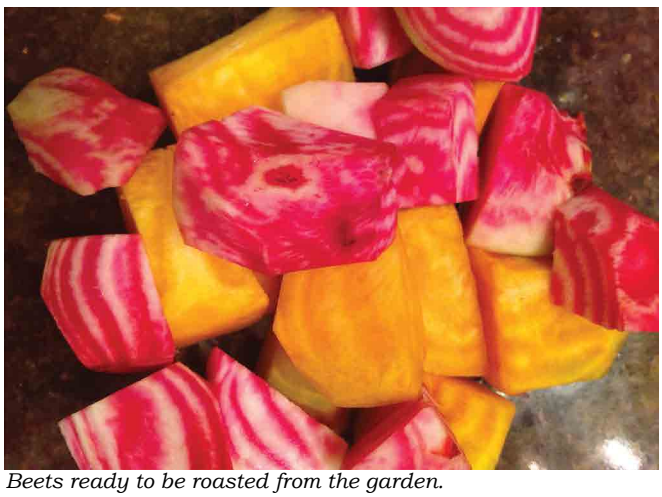
Vining plants should also be taken into consideration. Pole beans are pretty, especially if you plant an unusual variety, like Yard Long Red Noodles, or Tongue of Fire. In this case, the trellis can be just as important as the plant. Since it will take a large part of the season to

Bobby and Jessica with zucchini, squash and carrots.

Bobby with the tomatoes and dill in the raised beds.

cover the trellis, you want it to be attractive in its color and pattern. If you're looking for something with more prominent blooming features, you could try passion flowers, so named for the Passion of the Christ – check out the history sometime. The flowers are gorgeous and you can eat the fruit. I don't know if it's relevant in all parts of the country, but we call them maypops.

If properly managed, herbs are pretty and useful and bee-attractive. Rosemary is a neat perennial that thrives in the right areas and is sought after by the bees because it blooms off-season. Of course, it will take some pruning, but you can easily manage that from taking some for cooking. Basil is also a bee-frequented plant when it's flowering, and can be really interesting if you plant an unlikely variety, like bush basil or holy basil. Oregano attracts bees and can be a low-lying addition, but if the bees have too much at hand, the honey will taste weird. Mint is a hardy herb that will take over a landscape if you aren't careful, but it can come in handy in spots that won't grow anything else. Ginger is absolutely amazing. I know not everyone likes the taste (I am not a fan except ginger ale) but the foliage lasts all year, it's taller than average, the flowers smell fantastic, it's low maintenance, and it's a perennial. It should be regarded with the same growing abilities as a Cana Lily, but attracting honey bees instead of bumble bees. Bee Balm is an unusual plant that grows fairly tall as well, with bright red flowers (sometimes other colors) and seems to do okay even in poor soil. Although it is an annual, mine doubles in consumed area each year and the bees are always happy about it. I've never made tea out of it, but I've given it to friends for that purpose. Borage seems to attract bees, and it tastes like cucumber. I've heard the blossoms are good in salads and frozen in ice to put in drinks, but I have only sampled a bit to see if I liked the taste (I didn't but you might).



Beets ready to be roasted from the garden.

If you're looking for edible border plants, leafy greens are the way to go. Lettuce, spinach, pac choi, kale, sorrel, and swiss chard are good options. The Bright Lights swiss chard is one of my favorites because it's pretty from start to finish. The only problem with all of these is that they will need to be succession planted, so a schedule will have to be kept to make this area continuously appealing. Corn can also be used as a border if it's planted behind shorter plants. It will quickly outgrow any neighboring plants. Part of the garden planning will be to remember that not all of these plants will stay short or tiny and some will grow much faster than others.

Permanent fruiting plants can be a high-reward job if maintained properly in the initial phases. Blueberries, blackberries, grapes, and arbor kiwis are all examples of perennial plants that can give long-lasting benefits. Grapes, blackberries, and kiwis can all hide an ugly fence, or make a nice fence better. They can also be used to partition off an area, to climb a pergola, or to border another area. Blueberries can be used to line a walkway, giving easy access to anyone nearby. Strawberries are another eye-catching fruit that can be considered permanent if they are grown in the right conditions. They are excellent for producing bursts of red throughout the season if you plant everbearing strawberry varieties.

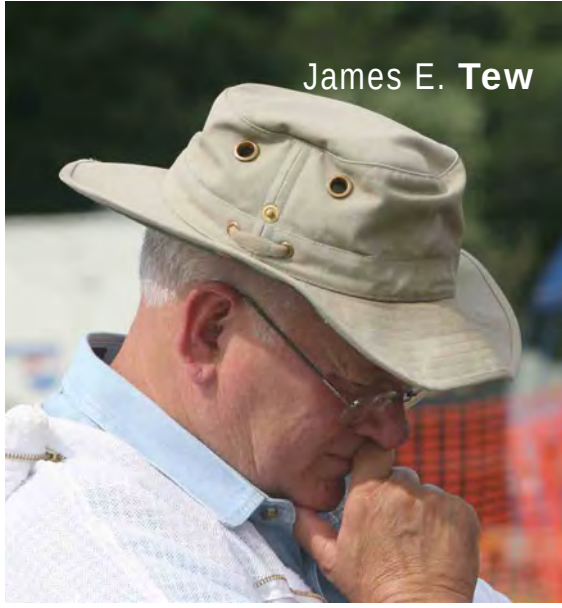
As I have repeatedly written about my penchant for tomatoes, I am not suggesting them for front yard planting. I grow them in the front yard, side yard, and backyard – I would grow them in the kitchen sink if I didn't need it to hold dirty dishes. However, they are sometimes a mess and are not going to make your nice front garden look organized and well managed. They need a lot of care to keep them in check and are going to have to be pulled up early if you have only determinates. I wouldn't suggest anything in the cucurbit family either (cucumbers, squash, pumpkins, etc.) because the runners can make these difficult to control, and the multitude of pests and diseases can make these look more like a science project than an ingredient for supper. Pests and diseases should be considered, because the front yard is not where a beekeeper wants to be seen spraying pesticides while touting the use of IPM or biocontrol methods.

The most important part of the entire effort is the planning. Not all plans work out, but it can at least be a baseline for beginning your project. There are several plants that I didn't mention that can work just fine, and anything can be tailored to your own tastes. In the end, it's really about making yourself happy. Having an attractive yard that has a high production value is no easy task; it is certainly something to hold in high regard. BC

Jessica Louque and her family are living off the land in North Carolina.

Bee Things Are Changing – Really Changing

The bees' keepers are changing, too.



This is a terrible time to write an article

I am still in shock, but it is now that time when an article is due, so against my better judgment, I will *"write while rattled."* (If things don't pan out, you will never see this piece.) The reason follows.

We expected around 600 participants

At the twentieth annual Alabama Cooperative Extension System Beekeeping Symposium that was conducted on February 7, 2015, we expected about 600 participants. That underestimated 600 number alone is amazing. For those of you new to beekeeping, just a few decades ago, 75-80 participants at a bee meeting was an astounding crowd. Now, having 1000 participants show up is not particularly surprising.

As near as our Alabama meeting organizers can estimate (based on pre-registration and walk-in registration numbers, a *completely* full parking lot, and no handout packets remaining) there were ≈750 participants from Alabama, Tennessee, Georgia, Florida, Mississippi, and one from Kansas. It was a terrifyingly pleasant surprise. Every part of the meeting organizational infrastructure bulged, strained, and creaked, but we hung on – though not without some glitches. *(If you were at this meeting, please know that these shortages will be addressed next year.)*

This meeting-size-discussion is not a boast about attendee numbers, but rather a realization that many beekeeping organizations are crossing the Rubicon of meeting size and organizational structure. Procedures that one time worked to design a meeting structure have increasingly becoming passé and outdated. Organizers have no choice but to change. Large meetings simply cannot be run the way earlier smaller meetings were run.

Meeting expectations have changed

I don't mean for this to be an article on how to run a bee meeting, but rather a piece on, "*What in the world is going on with these huge crowds, and how much larger will they grow?"* How should meetings adapt to meet greatly enlarged expectations, and still stay affordable?

Just a few years ago, the procedure was for a few dedicated people to bake a few plates of cookies – ideally with some honey in them, but even that was not required. In reality, any cookie type would do. To wash the free cookies down, a few gallons of watery red punch would be offered. Get a speaker, be sure you have an extension cord and a slide projector, and all is good to go. It's a bee meeting.

Don't count on that procedure for most state groups today. For instance, at somewhere around 400-500 participants, this food thing will usually require a professional caterer. So here is one of the many changes that are coming to the front – how does a member of the beekeeping group become familiar with the catering business and then bear the responsibility for selecting one? That specialized member resource will vary wildly from group to group. Some hit the mark while others don't....and then, there's the increased cost for the catering service.

I didn't come to this bee meeting to be taught computer stuff!

Presently, beekeepers are in two worlds – those who use electronics and those who don't. Those who don't use electronics all that much did not come to bee meetings to be taught to use a QR code or to be given a URL instead of paper handouts. They will readily tell the organizers this fact. They came to talk about bees and learn about bees.

Those who do use electronics – such as email – seem to change their email addresses about once per year, but they are literally blotters for electronic information. They soak up everything digitally virtual. A dedicated club member must devote significant time to maintaining mail lists of both types –surface and electronic. The electronic address list

Photographic proof of greatly increased beekeeping interest.

is constantly, constantly changing[1]. Make no mistake, this is a tedious task that someone must do if the beekeeping organization is to promote itself.

But really, it's always been this way, just not with so many people. During decades past, we sent postcards/letters or we made individual phone calls using phone-call-trees. *(During those years, people actually answered their phones when someone called them.)*

In the future, there will be those who will criticize me *"because he still only uses email"* instead of whatever new communication system is out there. It would, therefore, be wrong to label beekeepers who do not use the latest communication procedure as being out-of-date. Members who have not yet changed will always be among us because communication techniques and procedures will always be changing.

Sorry. Our meeting room does not have Wi-Fi connectivity.

Very politely, let me say that you are probably meeting in the wrong place. No doubt just a few years ago, a Wi-Fi-less room was not a problem, but increasingly, it will be now. It greatly limits what can be done at the meeting. Young beekeepers or technology-literate people will note this shortage.

Surprisingly, the room may be highly equipped for Wi-Fi, but no one knows the log-on information. Now, that's truly frustrating. You can see all of the equipment that is required around the room, but you can't start it up. Honestly, many times, the owners of the Wi-Fi equipment do not want extraneous users to use their equipment. Strange things can happen when strange people begin to tinker with this specialized equipment. If there is an acceptable phone signal at the meeting site, a mobile phone can be used as a "hot spot" for accessing the Internet, but someone must bear the expense of this specialized service.

Then be totally prepared for the Wi-Fi system to fail

So, all systems are a "go" and the electronically subsidized meeting gets under way and for whatever reason – the Internet or some aspect of the system is down and does not work. It happens all the time, but I love to think that the system will continue to get better as time passes. Until then, have an electronic media deck (i.e. PowerPoint) ready or have a DVD of the presentation in reserve.

Indeed, if possible (and it usually is not), the live, offsite speaker, who was going to be live-streamed to the meeting, will have burned his/her presentation to a DVD beforehand and submitted it to the meeting organizers. If the streaming process does not work, run the emergency DVD and have the remote speaker on the phone for discussion after the recorded show. This emergency procedure greatly reduces organizational embarrassment.

Okay, I'm starting to lose you . . .

If I keep going this way, this will really become a tedious piece for you to read. As I move away from the modern meeting topic, I need to say that I have not covered audio systems and their challenges. Nor have I mentioned multiple, marginally interchangeable computers – each with its own quirky operating systems and varying levels of software updates. Some thumb drives work and some don't. Are all the facilities handicapped accessible? Is there a plan for assistance when someone falls on the stairs? Whose insurance is responsible? How about all the bee club volunteers? The ones who move chairs and put out supply catalogs. The ones you could not get along without their help. How are they acknowledged? But this is enough on this subject for now.

Then there are the program topics . . .

Experienced beekeepers all know the routine topic selections: good queens, mite control, hive design, pollination needs, and honey production are some of the general topics that have been discussed thousands and thousands of times at meetings everywhere. To flavor these traditional topics, secondary topics such as bee trip travelogues, honey marketing techniques, and possibly a discussion on what plants should be selected to provide nectar and pollen for bees, are frequent meeting topics. Honestly, bee-meeting programs are predictable events presenting predictable topics. A good reason for this frequent repeat of a common topic is that there are so many new people. But at this point, I would like to focus on the nectar and pollen source topic that I mentioned.

Respect the *nectar and pollen* source topic

In my opinion, *selecting nectar and pollen plants for bees* has always been an informative *"filler topic."* Generally, this type of talk provides useful information that most people don't get around to implementing. It's much like the topics of making comb honey or producing your own

Flowering plants at an arboretum. It was too cool for bees.

[1]One of the strange tasks the list manager performs is removing deceased member names from the membership list. To me, it is a meaningful series of keystrokes to remove one from the list -- forever. When I was responsible for list maintenance, I would always think about the finality of the situation before I struck *"delete."*

queens. Most beekeepers will never do those two either, but they still want to hear about them. But, I now contend that the nectar and pollen topic should be bumped up to varsity topic status. Its time has come.

As beekeeping changes, more and more beekeepers live in towns or cities. The answer would seem to be brain dead – put in flower gardens having plants that your bees will work. In fact, I did that very thing. I bought native flowering plant seeds, tilled up a bit of my back yard and planted these seeds. For the next few weeks, I had open soil as the seeds germinated – not ugly but not attractive either. *(The birds enjoyed it.)* Then I had growing green plants that progressed nicely. Then I had weeks of beautiful flowers.

Then the decline started. Japanese beetles became more common than bees. The garden became increasingly scruffy and finally became outright unkempt. My neighbors with their perfect lawns and mulched landscape plants noticed my situation. Bottom line here – I simply don't know what I am doing with this flower garden thing and beehive requirements take most of my time. Remember the hypothetical guy that I referred to above – *I didn't come to this bee meeting to be taught computer stuff!* I'm more than a lot like him – only I didn't come to this meeting to be taught all this garden stuff.

Gardeners, I need help here – actually, I need a lot of help. I know there must be some form of "sequential" flower gardening that lets me have various plots of various plant species and ages so that something is always in bloom or will soon be blooming. Additionally, how can I efficiently manage the declining plots without sacrificing my bee time?

I have a typical life including family, grandkids, and friends. I have a bee program to run, and I need to continually learn computer software. I harvest and split firewood. I have a small vegetable garden that the deer and rabbits *LOVE*. I have a house and yard to maintain, and I do all this as a soon-to-be 67-year-old man. So, yeah, I want to do something with flower planting, but I will never be able to devote the time and energy required to be truly good at it. *(The Master Gardeners of the world are cringing right now.)*

Time and again, I have found British beekeepers to be models for many U.S. beekeepers. It is not uncommon to see photos of classy British apiaries with stone walk paths, beautiful flowering plants, and tastefully painted beehives. In fact, *Bee Culture's Catch the Buzz* cited recent research work showing that urban gardens were significant food resources for pollinating insects. This flower gardening thing is clearly a meaningful topic, but if I am not careful, I will be gently coerced into becoming a flower gardener at the expense of my bee colonies (that are already ignored too much). I would love to see your photos and get your gardening suggestions.

Here's the oddity . . .

The bees are the same now and forever. Other than evolutionary adaptation, they are solidly the same. Rather, it's the beekeepers and our supportive industry that are radically changing at this time. How we conduct our meetings, how we distribute information, where people are increasingly keeping bees, the number of new companies that are committing to beekeeping, the way we acquire our bees, and the greatly increased awareness of the importance of bees are some of the factors that are stunningly different compared to just a few decades ago. You must be an old beekeeper to see these changes. For those of us who can see them, the changes are stunning and invigorating. BC

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Sustainable Apiary Breeding

Several Techniques To Keep It Going

Larry **Connor**

Beekeeping organizations do not often incorporate business concepts while discussing the growth of their educational programs. In this article, we will look at a few ways that perhaps they should approach educational beekeeping processes as a business operation.

In the past few years two very different inspirations have entered the bee world resulting in attendance growth at meetings. The first was the re-awakening and rapidly expanding local foods movement, where people have decided that they could no longer support the consumption of food produced at great distances from their home and shipped in to local markets. I have a sweatshirt from the Alaska Farm Bureau that says "Grown Here, Not Flown Here." A friend of mine sells honey at the local Kalamazoo Hundred Mile Market, where all items for sale are produced within a one hundred mile radius of the market. Honey clearly fits into this formula, and the use of local bees for local pollination is supporting those beekeepers who chose not to migrate to California every winter for almond pollination, as well as many beekeepers who do. Another aspect of the local foods movement is the thought that local food somehow uses fewer pesticides in their production. Personally, I think the jury is still deliberating this matter.

The second inspiration has been the post Colony Collapse Disorder media blitz that has shown every-day people the importance of honey bees and explained their role in human food production. This has inspired tens of thousands of people to study beekeeping and motivated them to start keeping bees in a deliberate effort to 'save the bees'.

Producing food and honey is the common bond between these inspirations. The result has been an amazing surge in interest in beekeeping across the United States and Canada as non-beekeepers put on a bee suit for the first time and attempt to work bees.

Growth in the number of beekeepers has been profound for nearly a decade now, and I do not see any signs that the growth rate will slow – something many 'old timers' have been predicting since the increase started. These projections are based on prior experiences, when interest in beekeeping rose rapidly and then, just as rapidly, sharply declined. Dead-out beehives were stacked up in garages, barns or left to decay in open fields. A few find their way into the hands of other beekeepers only to be full of disease. Many of these beekeepers say they will re-enter beekeeping when they have more time to conquer the many challenges of keeping bees, while others just give up completely.

Perhaps those motivated by the local food movement are more likely to persist than those who want to save the planet I certainly cannot call that outcome. The most resent peak in beekeeping occurred during World War II, when food rationing increased honey and food production, provided beeswax for the war effort, and taught an entire generation how to farm. What I hope is that as many contemporary beekeepers continue to keep bees, and grow in the bee business over the years, they will help the industry while ensuring food production for an ever-growing human population. The question is how do we make this happen?

The business magazine *Inc.* has plenty to say about sustaining growth in a commercial business operation (but not much about sustaining growth in beekeeping). Consider this: *Sustainable growth is the realistically attainable growth that a company could maintain without running into problems. A business that grows too quickly may find it difficult to fund the growth. A business that grows too slowly or not at all may stagnate.*

To grow or to stagnate are challenges for all organizations. For the past few years the beekeeping industry has been experiencing out-of-control growth of meetings for non beekeepers and new beekeepers. These bring serious issues with funding and growth-related concerns. At the winter Beekeeping Symposium of the Alabama State Beekeepers this past February, organizer Dr. Jim Tew (who is retired from The Ohio State University but does contract work for Alabama), anguished over the fact that the Symposium had outgrown the facilities at Auburn University and they had to find a larger facility.

The February event was moved to a large auditorium at the Jefferson Community College in the center of the state. Pre-registration for the February event was stopped at 570 people, and a few dozen walk-ins were expected on Saturday morning. Everyone was both pleased and shocked that nearly 750 folks signed up in total, overflowing the facilities' 607-seat auditorium with folks sitting in the isles and giving any visiting fire marshal serious pause for concern and the right to close down the event. The rate of growth had clearly caused problems. To their credit the Alabama beekeepers were able to manage the crowd of people, provide lunch for those who preregistered, and offer a chance to visit with key vendors who traveled some distance for the event. As both a speaker and a vendor, I had plenty of interaction with local beekeepers and those considering beekeeping.

The Alabama team was very successful with their Symposium, but now must find a larger facility or somehow limit participation. This happens in other parts of the country, where a line or limit must be set to keep the event under control as far as seating, parking and meal options allow.

One option is to rent a commercial facility in a major city and pay a great deal of money for the space. This may have a negative effect by detracting people from traveling to a city location for a beekeepers meeting, and the risk of paying for parking. This may slow or reduce attendance, but for the wrong reasons.

Setting a limit thwarts the standard business model of growth of a program. The business options of Grow or Stagnate are not served by limiting enrollment, yet that is the easiest method I know to keep events under control.

Part of me wants these programs to be divided into multiple events. As I looked out at the crowd in Alabama, the show of hands indicated a split in the experience level of the folks filling the seats and isle-ways. The easy answer is to have multiple events, but then you need the organizers and vendors to do everything twice, and that is not a suitable option for most groups. Parents with small children often resort to "divide and conquer' separation of their children into separate rooms or each parent takes one kid and tries to keep them occupied without wondering what the other sibling is getting away with. This is an approach that works for extreme situations, but most parents want their children to play and work well together, and not require separation in order to achieve productive learning and play. Likewise I want beekeepers to interact with those just staring with bees and beekeeping so they can share what they have learned. The ideal meeting is one where a diverse group of individuals is able to meet and discuss bees and beekeeping on an intimate level, regardless of the size of the auditorium. This is an excellent way to find suppliers, a possible mentor and learn about programs that are educational and promotional for the area's beekeepers.

Ideas for Sustaining Growth

To sustain controlled growth, say no more than 10-20 percent per year, a planning group would need to expand their venue options every few programs or years and see what they can do to support the development of diverse programs. When the registration fee is raised $5 for a group of one thousand participants, that additional five thousand dollars can go toward facilities rental in a larger location. This money can also go for programs offered for the rest of the season, bringing in first-rate speakers throughout the season for evening, weekend and special programs.

What are some other methods a group can use to continue the growth of an educational program? Here are few I can develop, and perhaps we can get a conversation going with letters to the editor of this magazine.

Set a deadline for registration. While we all hate deadlines, having a registration deadline is a useful method to control the flood of participants at the door. In the case of the Alabama meeting, limiting participation to the 570 who pre-registered would have made the day much easier for everyone, especially for the fire marshal if called. This allows for growth to be slightly less chaotic, and is a good thing. Groups that do not allow for growth seem to be the ones that have poorer programs. I don't know why that is, perhaps adapting the attitude that the planners no longer have to work very hard for a successful event.

Develop a special program for new-bees. As a lecturer, it is hard to present to a group that is one-third experienced beekeepers, one-third beekeepers in their second to fifth year, and one-third brand new – never looked inside a bee hive before. Sometimes the inexperienced folks dominate the meeting. Offer a separate track, including a special keynote speaker just for the folks who are starting with bees and beekeeping. Then, and I think this is critical, invite a group of experienced folks from the club to meet with small groups of new-bees and talk about some of their aspects of beekeeping.

Follow-up with a Bee School with multiple sessions. It took me years to learn beekeeping and I do not think that a one day event should be called a bee school, yet that is what a majority of bee clubs do. Instead, have a one-day start to a multi-day event. Plan ahead and offer an eight week, or two eight-week programs over two years. Advise folks not to get bees until they have completed the course. When tied to the large symposium-type program, it will provide an overview to bees and beekeeping. These programs are often offered concurrently with the experienced beekeeper program, and allows the mixing of folks at the social programs but keeps them separate during the educational session. It also encourages vendors to set-up and participate at the event, since many major vendors are busy every Saturday during the mid-winter to summer meeting and business cycle. Some may get a weekend off in late August, so their weekend time is precious to them.

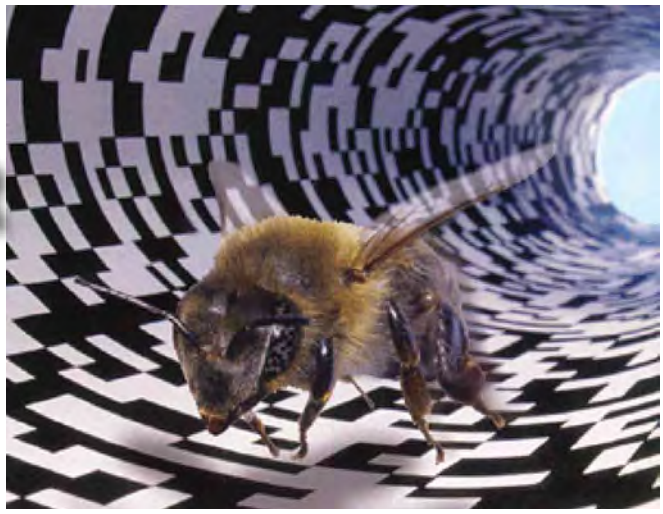
Increase fees a few dollars every year. If you are geared up for long-term growth of ten to 15% every year, plan to increase the registration fee from $2 to $5 to cover additional expenses, growing costs of travel for speakers and other expenses. While 'registration creep' can and does turn some people off, their numbers will be smaller than the new folks who want to learn to keep bees. Should the interest in beekeeping start to slow, a few advertisements and public announcements (such as on the local public radio station), will reach a larger audience. Somehow beekeepers have the incorrect notion that not-for-profit organizations cannot make money. Look at the large national charities and realize that they take in plenty of donations and pay fees, salaries, speakers, consultants and use a lot of their money for promotion. Charge a little more, make a little profit, and give it back to the members and the community in outreach programs, monthly lectures, school classroom visits and more. Use any surplus income to support a youth scholarship program – you and your club will be delighted with the outcome. BC

Wicwas Press is pleased to have two new titles about bees and queens. Mating Biology of the Honey Bee *by G. and N. Koeniger, J. Ellis and L.Connor.* Queen Rearing Essentials, *Second Edition, by L. Connor. Get a copy at* ***www.wicwas.com*** *or your local bee supply firm.*

IN THE EYE OF THE BEHOLDER

What Robots Can Learn From Honey Bees

David **Hargrove &** Sheridan **Tekosky**



Honey bees, usually thought of for their contribution to agriculture, are making their debut into robotics. Mandyam Srinivasan, a faculty member at the University of Queensland in Australia, has been researching how bees may lend a hand, or a wing, in the development of unmanned aircrafts. With video cameras as eyes, and computers as brains, Srinivasan's unmanned aircraft copy the honey bee's visual system to successfully navigate[1].

An odometer is an essential feature to any vehicle, let alone an unmanned one. Your car uses wheel movement as an odometer to estimate distance travelled over time, but how can a flying vehicle without rotating wheels gauge distance? One answer is, global positioning satellite, GPS, in which a satellite tracks the aircraft to see how far it has flown. Satellites, however, are expensive. Another answer may come from Srinivasan's experiments with the odometer that honey bees use. Honey bees use visual input to calculate distance they have travelled over a period of time. Srinivasan and colleagues investigated the relationship between a bee's vision and its odometer; they found that the amount of visual contrast in the terrain that the bees flew over determines the distance the bees report they have flown. How did they do this? They trained bees to fly to two feeders that were equidistant from the hive. To get to one feeder, the bees had to fly over water; to get to the other, they had to fly over land. When the bees returned to their colony, they performed a waggle dance to communicate the distance and direction of the feeder to their nestmates. The bees that flew over the water performed waggle dances that advertised a food source closer to the hive than the bees that flew over the land. The foraging bees had perceived the feeder located across the water as closer, because they used visual contrast to measure the distance they had traveled, and water provides less visual contrast than land. Applying this method to unmanned aircrafts has the potential to save a great deal of time and money by reducing the necessity of costly satellites, which are required for GPS. By using video cameras, sensors and a computer that analyzes footage to tell how far an aircraft has flown, the application of this method to unmanned aircrafts may soon become a reality[2].

Unmanned aircrafts must also keep from colliding with walls when travelling through passageways. Think of yourself driving a car on the highway: you have to make sure you stay in your lane, while also looking out for other cars in nearby lanes. Bees have to deal with this same problem when they fly through narrow passages. Srinivasan and his team had noticed that bees fly precisely through the middle of windows and door-frames and they wanted to understand how the bees accomplish this task. So he and his team experimented with visual cues, to see how bees would center themselves in a passageway. In this experiment, Srinivasan and his team placed bees in a tunnel with black and white striped gratings on the sides of the walls, similar to a chess board (see image). The walls, however, could move towards the end of the tunnel, or backwards, at varying speeds, while the bee flew through the tunnel. When the grating didn't move, the bees flew right down the middle of the tunnel. When the grating on one side of the tunnel moved in the direction that the bee flew (making it seem to move slower), the bee moved closer to that side. By moving closer to that side, the bee made the grating on both sides of the wall appear to pass by the bee at the same speed. When the grating on one side of the bee was moved in the opposite direction of the bee's flight (making it seem to move faster), the bee moved away from that side. As before, the grating on either side would now seem to move by the bee at the same speed. By changing the speed of the gratings that flew by the bee, Srinivasan and his team were able to alter what path the bee perceived as equidistant from either side of the tunnel. This experiment indicates that bees not only use visual information for odometry, but also to center themselves in passageways.

This technique could be used in unmanned aircraft that need to stabilize themselves in narrow passages. With just two cameras and a computer, the aircraft can keep itself centered by changing its position to keep the image speed of the two walls equal[3]. These methods have been used in early robotic models that can avoid hazards while flying, such as Optoelectronic ocelli, which uses an insect-inspired visual system[1]. Though Srinivasan has yet to see his contributions to robotics spread commercially, these techniques have worked in early models. If honey bees become the template for the unmanned aircraft of the future, we will have yet another reason to thank the ever-astounding honey bee. BC

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GEEZER RIDGE FARM

Jack **Blackford**

Ed Forney of Geezer Ridge Farm with his helper Waldo in the bee box building corner of the woodworking shop.

When stepping into the cavernous beekeeping workshop of Ed Forney you must be prepared for a big KISS. A big wet Keep It Simple Stupid kiss planted right into your brain. The driving philosophy behind Geezer Ridge Farm is "you are just putting bees in a wooden box." Don't show up here saying someone told you that your supers had to be off July 4th week, there is no beekeeping by the calendar up here on the side of the mountains. Instead Ed will ask you what your bees are doing, if they are still bringing in plenty of nectar put on another super instead of taking them off because someone set an arbitrary date about when they should be taken off. Ed doesn't allow his bees to keep calendars in the hive, they tell him what they need and he obeys their every wish no matter what time of year it is. Bee biology is what drives Ed's decision making, and he makes sure you know why you are doing something to support the bee biology, not just doing something you don't understand because someone told you its the day to do it. One of Ed's biggest challenges is getting new beekeepers who absorb so much from the internet gurus into separating facts from opinions.

It all started with Cheryl, Ed's wife, who wanted a peaceful stress relieving hobby. Her only wish for Ed's involvement was for him to lift her heavy supers off when they were full. Ed thought about this arrangement for a while and figured out that by the time you get your bee jack on, get your smoker fired up, find all the bits and pieces you need for a trip to the apiary you might as well start with six beehives. So Cheryl dragged Ed to our group's beginners beekeeping class, she cleared out a spot for six hives, they purchased their woodenware and bees and started to be beekeepers. Ed was a cabinet maker, he soon found that playing with bee boxes came naturally to him and he began making sure all their boxes were perfectly square and flat with no gaps between boxes. They found a good mentor, James Copenhaven, who works with everyone in our beekeepers group, the West Virginia Eastern Pandhandle Beekeepers Association. James helped them keep their first six hives alive. Ed got excited about beekeeping and expanded another 15 hives the next year making splits. Ed soon learned he had a natural drawing towards bees, not so much making honey as Cheryl wishes, but for growing lots and lots of bees.

They added another mentor, the WV apiary inspector Paul Poling who along with inspecting hives is also a commercial beekeeper. Paul taught Ed about making a Bee Engine. A lot of people say to keep your hives equal all year and to take resources from your strong hives to knock them back and give to the weaker hives. The problem with this method is that is doesn't let the strong hives get very strong and so it doesn't reach its true potential of creating the maximum number of bees possible since its always being weakened. By making a Bee Engine, you first make sure that the strong hives stay strong, don't try to equalize the hives but keep the strong hive strong and then take from it to boost other hives. By keeping strong hives strong there is always a supply of resources to make nucs. The Bee Engines job is to build foundation and make bees.

Paul taught Ed how to manipulate frames to expand production hives, combining the resources of two strong Bee Engines to create an instant new production hive. Ed has adopted the eight-frame nuc and 10-frame production hives. He likes using eight-frame hives as nucs as the bees grow faster in an eight-frame over a five-frame nuc. They also overwinter better and you can knock an eight-frame hive back to three frames with a good queen and have it build up fast again. Ed starts with two strong eight-frame hives, hive A and B, each with eight deep and eight medium frames, full of bees and brood. The new hive gets 5 frames from each A and B deep and medium boxes. The deep gets bees shaken out of hive A, newspaper gets put over the deep, the medium box added and bees are shaken from hive B. Drop in a new queen, either leave the new hive in place or move it to a new apiary. Ed quickly expanded to 130 hives by their 3rd year and then soon it was starting to get hard to count the number of hives Ed was running.

Another Geezer Ridge Farm philosophy is that smart people at MAAREC, Penn State, University of Maryland and Cornell and the USDA among others have all dedicated themselves to helping beekeepers not only keep their bees alive but to help them expand their colonies. One of Ed's passions is scientific beekeeping, getting rid of a lot of the voodoo and myths that keep killing backyard beekeepers bees. Anyone with a camera who successfully installs a package and films it and posts

The Honey House at Geezer Ridge Farm will be fully operational soon when the large extractor gets installed. Mead makers are waiting to try some of the tons of honey Ed has stored in his basement while the Honey House was being constructed.

it to yutube just became another bee expert spouting their newly developed beekeeping philosophy witchcraft, even before they have overwintered a single colony. In contributing to educating beekeepers Ed offers many free workshops and hands-on opportunities at Geezer Ridge Farm. These workshops are guided by people's questions rather than a predetermined presentation, though they do start off with a timely seasonal topic. Ed is also a natural easygoing patient teacher, just like his mentor James, and more and more people are coming to Geezer Ridge Farm to learn about keeping their bees alive. One of the high quality indicators about Geezer Ridge Farm is that there is never a sales pitch, the shop is full of whatever you could possibly need to care for your bees, Ed is an independent salesmen for many different bee companies, you have to ask for something, the classes are not set up like some businesses to tell you what you need and then sell to a captive audience. This is one of the strongest points you should look for in a mentor, if they also sell beekeeping hardware or bees, are they teaching you to just follow their philosophy and herding you into buying their stuff or are they trying to make you think and can help you get what you need versus filling your truck up with only what they tell you that you want? At Geezer Ridge Farm you are not given a hard sell which makes the new beekeepers much more comfortable in asking questions.

Completed boxes already filled with frames stretch far back in Ed's workshop. Ed's style of feeders (left) with large screened opening on each end allows in enough light to inhibit the bee from building comb under the feeders.

One of the interesting adaptions driven by bee biology is seen in Ed's hive top feeders. The typical plastic two well feeder with a divide in the middle allows plenty of room for bees to build comb between the wells. Ed knows that light inhibits comb formation and modified his hive top feeders so that they have a large circular vents in the ends. These large mesh-covered vents allow in enough light to inhibit the bees from building combs in the gap between the wells. It's just a simple bee biology observation that makes keeping bees easier, no more scraping comb from feeders, no more accidentally cutting a hole in the plastic! Another bee biology observation is that you can drop a frame of foundation into the middle of the brood area when its warm enough and the bees will quickly pull the comb and the queen will fill it up with eggs. Splitting the brood is not something the common mantra allows, yet observing simple bee biology has allowed Ed to quickly get a freshly pulled frame with new wax filled with brood allowing him to keep his Bee Engines going at full speed.

Ed was now growing so many bees by keeping strong hives strong and by manipulating frames he began to sell bees to us locals. Ed has an interesting adopt-a-hive program. Here, beginners who are thinking about getting into beekeeping, start by making a nuc from Ed's hives and go through the whole process of tending to the hive and expanding it into a full production hive under Ed's guidance. This patient hands-on approach gives people the experience to see if they are really cut out to be beekeepers without buying all the equipment. Ed gladly points out that not everyone who has come through the adopt-the-hive program ended up getting bees, some were not cut out for it, but they all enjoyed the experience. The successful beginner then makes a nuc from the hive they have been tending and takes it home to establish their own colony.

Geezer Ridge Farm has a Build-Your-Own-Nuc program that is growing in popularity, this idea is unheard of in most places. You take your nuc box, go through Ed's hives and hand pick out the queen and brood frames you want and shake off some extra bees from his strong Bee Engines. If you don't shake in enough bees Ed shakes a few more in for you, he wants everyone to succeed. Ed also supplies frames of honey and pollen so you leave with a nuc you put together, with a queen you picked out, with the combination of frames you choose. What a great system more apiaries should setup to give their local customers a great boost of confidence. Ed also sells queens, all year for those who suddenly find themselves queenless off season and who are trying to save their hives.

Ed so impressed his mentor Paul Poling that Paul recruited Ed to become an official WV state apiary inspector. One of the job responsibilities is to help administer the West Virginia Vetrans & Warriors to Agriculture Project. Ed is an official state certified beekeeping trainer for veterans through his state apiary inspectors position in the Department of Agriculture. This is a free program for veterans, initial funding is through a WV reeducation grant for honorably discharged

New beekeepers attending a Geezer Ridge Farm Nuc class in Ed's huge bee workshop.

veterans. James McCormick, Director of WV Veterans and Warriors to Ag, who was just awarded the Silver Star, works hard to help support the WV program sending Ed out to recruit veterans into the program and setting up teaching opportunities state wide. Ed points out that these legitimate programs are free, there is no charge for participating in state sponsored programs, the veteran has control over where they want to keep their hive, there is no contract that controls where they do their beekeeping at. The goal, depending on funding, is to set up each new beekeeper with two beehives. If you have any questions about who can provide free legitimate state funded training contact Ed or the head of the program, James McCormick at 304-558-3200 and email at **jmccormick@WVDA.US**. There is also a Facebook page for help for veterans in joining the free programs.

Full disclosure, Ed is also one of my several mentors, he encourages people to learn versus preaching about beekeeping voodoo. When visiting Ed be prepared for a hands-on opportunity at any time and make sure to take good notes. Geezer Ridge Farm is located at 173 Rooney Road in Hedgesville West Virginia 25427. They can be reached at 304-702-3848. BC

*Jack and Toni live on a small farm in WV growing bees and apple trees and can be reached at **wvmjack@gmail.com**.*

All The Buzzz in...

Hello Friends,

April is national poetry month. To celebrate, send us your bee poems and we'll send you a prize!

Bee B.Queen

Bee B. Queen Challenge

Hunter Hemmis, 9, PA

Lori Rabei, 11, OH

The Beauty of the Bee Brain

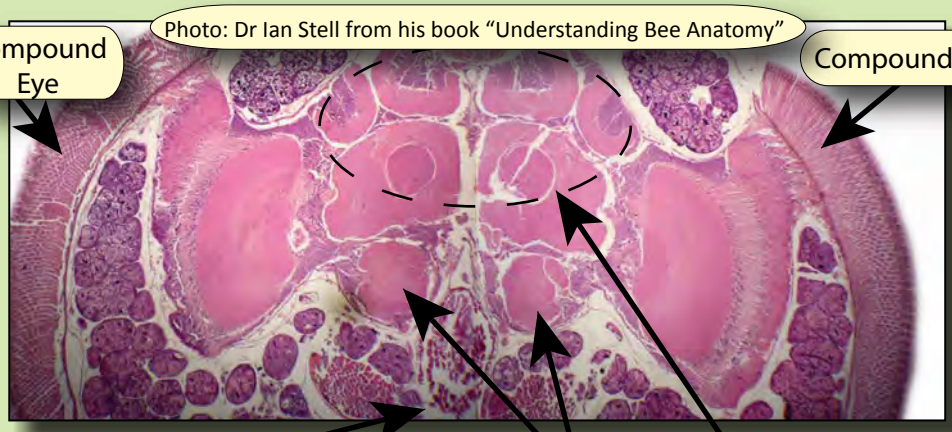
Honey bees can do amazing things. They are capable of learning and have short-term memory. Honey bees leave the hive to find flowers for food then they must be able to remember the way back to the hive. Once back home, bees communicate with their sisters telling them where the flowers are and the best route to get there saving them time and energy. Some scientists think that honey bees may even be able to count landmarks. Experiments have shown that bees can even memorize human faces. For all this, we can thank the bee's brain.

This is a stained slice of the bee's brain magnified many times.

Honey bees, like most insects, not only have a brain in their head but they have several sub brains or ganglia spread throughout their bodies. There are 2 ganglia in the thorax and 5 in the abdomen. The ganglia send and receive messages throughout the body and its organs.

Flying and walking is controlled by the ganglia not the main brain. So if a bee loses its head literally, that bee will still be able to move its legs and wings and even sting. Flying is out of the question since a bee without a head does not have balance.

Photo: Dr Ian Stell from his book "Understanding Bee Anatomy"



The lower part of the brain controls the mouth parts.

The antennal lobes are connected to the antennae and send messages to the bee about smell.

The parts of the brain that helps the bee to learn and remember are called the mushroom bodies. Can you guess where they get that name? Yes, in most insects they do look a little like mushrooms, in the honey bee not so much.

Brain Size
The main brain in the head of the worker bee is about the size of a sesame seed.

The Beginning of the Bee Brain
The bee brain begins to develop during the three days the bee is an egg. It continues to grow throughout the bees development unlike many parts of the bee that dissolve in the larval stage and are reconstructed again in the pupal stage.

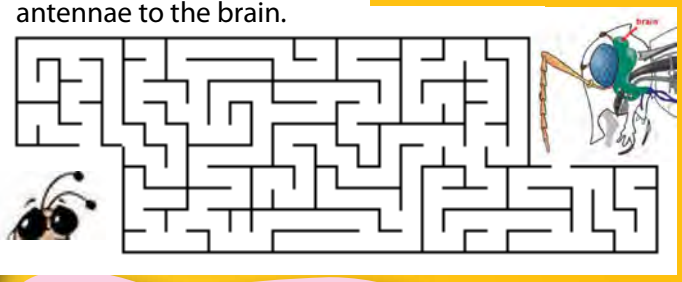
... Bee kid's corner

Produced by Kim Lehman - www.kim.lehman.com
www.beeculture.com
April 2015

Townes, 5, TX

Smell Signals

Send smell signals from the antennae to the brain.



Bee Brain Experiment

Can bees recognize and remember patterns? Try this easy experiment at home.

Materials:
• 5 index cards • A black marker • 5 ziplock bags • 1/4 cup sugar • 3/4 cup water • 5 small identical dishes

Experiment
1. Draw a different shape on each card. Be big and bold. Place each card in a separate ziplock bag. This will protect the card from the weather.

2. Mix up some "nectar" using one part sugar to two parts water. Boil to dissolve the sugar and let it cool.

3. Lay the bags outside with the shape on the cards facing up. Find a flat, sunny spot where they will not be disturbed. Space about 2 feet apart. Hold the bags down with a rock or stake so they do not blow away.

4. Place a dish next to each card. Pour the sugar water in one dish. Pour plain water in the others. Remember which shape has the sugar water.

5. Time to observe and take notes. How many days does it take before bees find the one with the sugar water? A few days after you've seen bees at the sugar water dish, switch cards so the shape next to the sugar water is now by a dish of plain water. What happens? Now leave the cards where they are, but switch the sugar water dish with another dish of plain water. How do the bees respond? Does the weather affect the bee activity?

Experiment Spin Offs
Observe other insects. How do they respond?
Try the experiment using different-colored circles.

Bee Buddy

My name is Jalyn Piechowski and I am 10 years old. I am the 4th generation beekeeper in our family. I have four beehives that I take care of with the help from my family. My bees are setup to make comb honey to sell to our customers. I take bees, honey, and beeswax to our county fair through my involvement with 4-H. I attend the Wisconsin Honey Producers Fall Convention to learn about bees. I have even attended many of the American Beekeeping Federation Conventions. In the spring I enjoy going to the bee yard to see if my bees made honey. I also work in the honey house helping bottle honey with my family. When I am not busy with bees I enjoy basketball, softball, four-wheeling, snowmobiling, and sewing.

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: beebuddies@hotmail.com or mail to the above address.

If you can't spell it, or pronounce it, for goodness sakes don't eat it

DOWNTOWN

Third Graders Demand To Paint Your Woodenware

Third Graders Demand to Paint Your Woodenware

A room filled with 55 nine- and 10-year-olds, four gallons of paint, three dozen boxes in various states of completion, glue and a bag of hammers may sound like a recipe for terror to many of you, but around here we call this fun at its most elementary.

Many schools in many cities have a day of service once or twice a year: often, that day is in honor of the birthday of the Rev. Dr. Martin Luther King, Jr. That January day is important for factors in addition to honoring a great American: across much of North America, beekeepers are beginning to plan for and acquire the woodenware they will put in the field in the season ahead, so there is an obvious connection between need and resources. The DC Beekeepers have been approached several times over the years with offers of the help of young hands on such occasions, and we think we have a way of getting them involved that might work for you, as well. This year, the party was at Hyde-Addison Elementary School in Northwest Washington, DC.

We've done this as a half day a few times, with a couple of different age groups, and we learn a lesson or two each go 'round. We'd like to share a central truth, however: it is a hoot and a half to build and paint woodenware with kids. And after that, they go home and tell their families more about bees than their parents ever knew (you'd be amazed), and then they come back to ask what else they can do to help, usually over the long term. This, my friends, is a great day out.

Room Full of Kids, Paint & Boxes

And a proviso: this is not artisanal labor, and at least a couple of beekeeper volunteers each year prefer NOT to put their woodenware on the assembly line. We have some experience with which tasks to assign to which ages, how to supervise, and where it is easiest for kids to help (and least likely for them to do damage) that we can share, also.

What's in it for them?

If you think about your woodenware, it is a reflection of many things that we have learned about bees, seasons, weather, physics, biology, human society, economics, and engineering, to name a few. The finished canvas here gives kids a place to express themselves via art and language. There is a ton of thought in a hive tool, a frame, and a box of any size, and learning through your hands simply does not happen enough in school.

Putting this stuff together, talking about bees with beekeepers while you are doing it, taking a look at an assembled hive and seeing how the pieces fit, and then deciding what you want to say about it at the end is an experiential, educational foundation that the science teacher, or the kid themselves, can build on long after you leave.

How we do it

This project is easiest to accomplish with educational partners within the school itself. If *you* are proposing the activity for January, get in contact in September. Just remember, when everyone knows everyone, things naturally go more easily. And Year One is the only time when you might not know anyone. This is also not a cost-neutral activity: while the labor is free, several dozen paint brushes, etc., are not, and it might be worth asking if the school can either supply materials or pick up some expenses. In our case, the Fairmont Hotel provided a small grant to the school, which included not only painting supplies but also some of the woodenware.

You will need help managing students in groups on school property, and it is not only appropriate but also *critical* to have the kids' usual teachers and some parent volunteers on hand. When we did this year's group of 55, we had eight beekeepers, three third grade teachers, two science resource teachers, the vice principal, and six parent volunteers: one adult per two to three kids. Did you notice that the janitor stayed clear? Expect that: for them, this is usually just more work, and you should learn ahead of time how they need the site to look when you leave, and what clean up you are allowed to do on site afterward (we got in trouble for clogging a sink with paint from the brushes last year, so we buy cheaper, throw-aways now).

The age of your student group matters, but maybe not as much

as you think. I will attempt frame construction with high schoolers, but the quality is just not reliable enough to make it worthwhile for me: for them, it is still an education. Whacking together brood boxes and supers, and slapping paint on telecovers, however, works for everybody.

To determine how much total gear needs to be present, I figure out how many kids are there, and divide by four: each kid will be invited, by day's end, to decorate the final coat on one side of a box with their picture or message for bees. Telecovers are a large, amazing outlet for creativity: the kids get the option of collaborating with one or two of their friends on one of those.

Putting the pieces together

The day starts with a very short talk about bees, why they are important, that they live in hives, and that the kids will be making hives and learning how they work. We want them to learn as much about bees as they can, and then paint a message for the bees, in words, pictures, or both, on one piece of gear.

Then we don protective clothing, as many good beekeeping activities require. Though we warn the kids' families to send them in crummy clothes, we also come armed with smocks: I have been saving my husband's old shirts for several years, and I also buy 12-packs of plain white men's t-shirts when they are on sale. I usually have about four dozen smocks on hand, but it is completely reasonable to ask the school to either handle or help out with this. They've done this before.

We then divide the kids into four stations, which then rotate between four tasks: assembly, priming, decorating, and visiting a demo hive. With paint, it's unlikely that you will get enough boxes to a second coat in time for a kid to decorate it, so I organize the room a bit like a cooking show, with some stuff done in advance:

- *Station 1:* A completely assembled hive (no bees, but comb OK), with bottom board, inner cover, frames, etc., with a beekeeper and a science teacher to demonstrate it;
- *Station 2:* A stack of raw ingredients (lumber, nails, wood, glue, hammers, squares, levels) with at least two experienced beekeeper woodworkers to supervise, additional parents helpful;
- *Station 3:* A bunch of raw boxes ready to be primed, with either beekeepers or parents on hand;
- *Station 4:* A set of assembled, white-painted boxes (estimate number necessary by multiplying number of kids by 2/3, then dividing the number by 4) and a few telecovers already primed and painted with one dry coat, ready for artwork and supervised by both parents and beekeepers (to make sure no hornet nests or inaccuracies get in there).
- *The kids' classroom teachers* float and help maintain order. If you can, arm them with trash bags, just because.

The demo hive is important for two reasons: to provide context for all the pieces the kids will be handling, and to provide a place to go and ask questions if there is a lag between tasks (say, a kid completes building a box before there is room at the priming station to paint it). We put a science teacher with a beekeeper there for two reasons: one is that the former knows how to wrangle kids, the other is so that the Science Department knows a lot more about bees before the day is over.

If beekeepers bring woodenware to be assembled, painted, or re-painted, put those pieces at the front of the appropriate line, and mark everything INSIDE with the beekeeper's name, preferably using a Sharpie. At the back of the line? Woodenware that will be used in public or club programs.

You need good carpenters with good communication skills for assembly. Though "Pre-Teens with Hammers" sounds like the name of a heavy metal band, they are actually pretty attentive to lessons on safety, especially when couched in "why." And some kids can be *told* how to hold and use a hammer, and some need to be *shown* (just like grownups) so your volunteers need to be comfortable with physically interacting with the kids to adjust a grip, and should consider, as much as possible, leaning or sitting down to work – and converse--on their level. A kid who cannot pay attention needs to be called on it (kindly), and a teacher or parent may be called upon to intervene.

If you want to increase the overall quality of the painted work, consider offering just assembly and final painting, and organize your raw materials to suit. The kids are pretty gloppy painters when an adult is not hanging over their shoulder saying "not so much on the brush!" and primer in particular seems to stick thick. Dry time is also greatly reduced in this scenario, though you need to do more ahead of time and bring more gear in general if you only want the kids touching the pieces at

the beginning and end of the process.

All the quality issues get better as the kids get older, but if you are particular, bring boxes that are either in pieces or ready for artwork-only to this party. The kids do a pretty good job with assembly, and it is worth teaching them about levels and squares.

To control paint madness, we had a primer table and an exterior latex table, each manned by a volunteer who handed brushes to kids along with a single disposable cup containing the necessary paint type: no kids handling gallon cans of paint! No huge floor spills to clean up after!

The latex table had three pastel colors (blue, yellow, and pink) as well as a selection of small "sample" containers of darker primary colors. Paintbrushes and cheap art class brushes were available for decorating. We found that the kids would request that the volunteer mix a little yellow and blue to make green, or red and pink to make lavender, resulting in quite a wide palette of colors.

Oh yeah, and five words: tape down your drop cloths.

Finishing up

Don't keep your kids going right up until the school session ends. You will need at least 45 minutes to get them sorted out, out of there, and to clean up. Have trash bags ready and circulate to collect discarded brushes, cups, etc., and use them for the tape you will pull up from the drop cloths. Ask the teachers to help get the kids in order, stack the pieces they have been working on in a designated space, take off and hand over the smocks. We usually work on Friday, so I usually ask the school to let me leave woodenware until Monday AM for pickup.

It's kind of cool to bring a stack of age-appropriate honey bee coloring books to hand out as they leave: two are "Welcome to Our Honey Farm" from Glory Bee (a little pricey for big groups) and "Honey Bee Activity Book" from Dadant (for a third as much). This brings the day's work home and repeats many lessons and conversations without as much hammer noise.

Take a minute to admire the artwork after the kids are gone. Talents are at all different levels at any age, but the hearts tend to be full, and it shows. Go ahead and take pictures, but make sure you understand the school's policy on where you can show them.

And don't let your volunteers (including the parents) go until you have that room in the shape that you promised: this might involve scraping paint on the floor with a hive tool, or scrubbing a blob on a wall with wet paper towels. Roll up the drop cloths and stow them with the drying gear (unless you are using disposable). Get the trash bags into dumpsters, wash your hands, and know that no one there will ever forget what they did that day. And if you are lucky, you will be taking home some of those boxes to remind you. BC

Toni Burnham keeps bees on rooftops in the Washington, DC area where she lives.

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One generation plants the trees, the next generation gets the shade.

Chinese Proverb

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A beekeeper in New York writes:

Dear Phil, I have been trying to sort out my thinking about – AFB and come down to the essay below. Please read it critically and let me know of any loopholes in my information and logic. I am not going anywhere with this essay but I would suggest that if you run out of questions, you might do a piece on modern handling of the AFB situation and what you and others may see about its management in the future.

- Some diseases, American Foulbrood of Honey bees (AFB), for example, don't lend themselves to eradication. A large feral population of bees in which AFB can exist with impunity lies outside of the range of normal beekeeping activities. Yet States have passed laws for the control of AFB.
- In the 1930s, when I was a teenager, the bee inspector from the New York State department of agriculture detected AFB in one of my three colonies. By law I had to kill all the bees, burn the hive and bury its ashes. Today some 80 years later the law still stands, requiring the same treatment.
- Although today, an antibiotic, Terramycin, controls the vegetative stage of AFB bacteria, it does not kill its spores, which still hide in the combs and equipment allowing flare-ups of the disease. The entire beekeeping industry in this country now depends on that one antibiotic, which, when it fails, sends the beekeeper back to burning his bees and equipment. Eventually Terramycin will fail completely.
- Whatever, The beekeeping industry is in dire need of better control measures for AFB than the incomplete control that Terramycin affords with its back-up of kill the bees with their brood, combs, and frames when Terramycin fails.

Phil replies:

Fortunately American Foulbrood is not a widespread problem, but when it strikes it is extremely serious, almost always ending in the death of the colony and the rapid spread of AFB to nearby hives and wild colonies. I agree that eradication of this highly contagious disease is unlikely, in part because of the continued presence of feral, or unmanaged, colonies in trees and manmade structures.

AFB is a bacterial disease of honey bee larvae. Though adult bees spread it, they are not susceptible to it. Like nosema, AFB is a caused by a spore forming organism. (S*ee my March '15 column for a Q&A about nosema*). Whereas nosema spores are created in infected cells in the guts of adult bees, those of AFB are produced in the guts of larvae and pupae. The dead pupae decompose into a dark, gooey mass which dries over time and forms a dark, hard crust. This crust, referred to as scale, adheres firmly to the lower sides and bottoms of the cells. A single AFB scale can contain as many as 2.5 billion spores, and a single spore can be sufficient to infect a larva. In some ways spores are like seeds, but another way to think of them is as a sleeping form of the disease. They can remain viable for decades in food, wax, or woodenware, resistant to high temperatures, disinfectant chemicals, and ultraviolet light. The bacteria enter the food supply when honey bees pick up spores on their mouths as they clean infected cells or when nectar and pollen are stored in infected cells. When spores are fed to a very young larva via contaminated food, the bacteria enter what is known as the rod, or vegetative stage, during which they are not infectious. In that state, however, they grow rapidly inside the larva, each bacterium capable of producing millions of new spores before it dies. And so the cycle continues.

AFB not only spreads quickly within an infected hive, but also from hive to hive and apiary to apiary. Colonies which have succumbed to or have been weakened by AFB are susceptible to robbing by bees from stronger, uninfected hives. The robbers carry spores back to their own colonies in contaminated honey. That's why you're correct in saying that, even if we could eliminate AFB in managed colonies, feral bees would be a continual source of re-infection. Another source is the beekeeper him or herself. The disease is easily spread in the course of moving frames of comb from one hive to another for swarm control, the creation of nucs, or to reinforce a weak

American Foulbrood (photo by Zachary Huang)

hive, etc. It can also be introduced in purchased hives or nucs and in used equipment - especially used comb.

The best way to avoid unintentionally spreading AFB through the movement of hives or frames is to learn to recognize the signs of the disease. It is often characterized by scattered capped brood cells interspersed with empty cells where pupae have died and been removed by the bees (though other conditions can also result in scattered brood.) The cappings that remain are dark, sunken, and sometimes greasy in appearance (dark capping may have other causes as well), and often contain punctures - a result of bees opening the cappings to remove infected or dead brood. Of course, foulbrood gets its descriptive name from the pungent or foul odor that infected brood emits. However this AFB bouquet may not be detectable in early stages of the disease, and for beekeepers with limited experience, the smell of decaying brood, dead from other causes such as *Varroa* mites, may lead to misdiagnosis. Almost every Fall, I receive calls from panicked novice beekeepers, concerned that they are smelling AFB in their hives, when what they are sniffing is instead the pungent odor of fresh aster nectar. The only definitive way to diagnose AFB, other than sending samples to a lab for testing, is the ropiness test in which a toothpick or twig, inserted into a suspect cell and then slowly pulled back, draws out a strand of liquefied pupa with a sticky, ropey appearance. The absence of this phenomenon doesn't indicate the absence of foulbrood since the pupa may not yet have decomposed to that extent or may already have become desiccated, but its presence is confirmation of AFB.

Because it is so highly contagious and has been around so long, American foulbrood is the reason that state apiary programs were originally created. Although the role of state apiarists has expanded and adapted to cope with modern beekeeping challenges, many states still have regulations, like the NY law you cite, requiring mandatory inspections and compulsory burning of infected hives. In practice, most state apiary programs are not staffed to conduct mandatory inspections of small scale beekeepers, and only perform inspections to them upon request, and on a schedule permitting basis. However, when any beekeeper suspects AFB and asks for assistance in diagnosing or managing it, a quick response by apiary inspectors is the norm. Not only can the appearance of AFB in a single hive result in the loss of an entire apiary of bees and valuable equipment, but the chances are also high that neighboring apiaries and feral colonies will become infected as well. State apiarists take this risk very seriously.

For many years, the only recourse for an outbreak of AFB was killing the bees and burning the hives - body, frames, and all. Eventually, sulfa drugs offered an alternative to destruction, and then the antibiotic Terramycin (oxytetracycline) came along and seemed like a panacea. Beekeepers embraced it and used it liberally, some at the first sign of foulbrood, others routinely to prevent outbreaks. Many experts encouraged this practice. Predictably, frequent use has led to significant Terramycin resistance in some areas. In 2005, the FDA approved another antibiotic, Tylan (tylosin), for the treatment of Terramycin resistant AFB in honey bees, and since then a couple of generic versions of tylosin. However, as you point out, the problem with any antibiotic is that

Chalkbrood (photo by Jon Maybriar)

it only kills the bacteria in the active, vegetative phase inside the larval host. It does not kill the numerous, long lived spores which continue to be a source of infection to other colonies. Antibiotics mask AFB by suppressing the stage of the disease which produces symptoms, but they do not eliminate it. I think that the best response to an outbreak of AFB is still to burn infected hives and to monitor others for signs of the disease.

That does not mean, however, that we're back to early 20th century methods of dealing with AFB. Though we may not be able to eliminate it, we have a new tool for limiting the spread of foulbrood in the form of bees selected and bred for hygienic behavior. Hygienic behavior is an interesting and valuable behavior naturally expressed by honey bees to control brood disease and parasites. It consists of detecting, and removing from the hive, brood damaged by disease or parasites. A clearly visible example with which some beekeepers may be familiar is the removal of pupae infected by chalkbrood, another brood disease of honey bees caused by a fungus. Outbreaks, usually occurring in the spring, are normally short in duration and not considered serious though, if persistent, they can be harmful. The infected larvae die shortly before or after being sealed in the cell, and dry into white mummified remains which resemble small pieces of chalk – hence the name. Typically, beekeepers first become aware of the disease when they see numbers of small, white bodies littering the entrance and the ground in front of the hive. Hygienic behavior is also recognized as a tool in the control of varroa mites, especially when enhanced through selective breeding. The value of this trait for the control of American foulbrood was first described by researchers in the 1930s, and considerable additional research was conducted in the 1960s and 70s. More recently, Dr. Marla Spivak and her students at the Univ of MN have developed a line of highly hygienic honey bees, called Minnesota Hygienics. The USDA Baton Rouge Honey Bee Lab has produced two others: the SMR line (short for Suppression of Mite Reproduction), and the Russian Honey Bee line. Hygienic bees suppress outbreaks of AFB and inhibit its spread by removing infected larvae from the hive while the bacteria are still in the vegetative stage *before* they produce new spores. Requeening hives with hygienic queens can improve a colony's resistance to several diseases and pests, and is especially beneficial in hives which display no foulbrood

symptoms but share an apiary with a hive which has been affected by AFB.

In summary, though we cannot eliminate AFB, we can control its spread and prevent the devastating losses that accompany large outbreaks by the following means:

Prevention: Reduce transfer of diseases, including AFB, by moving only healthy hives, brood, bees, and equipment into our apiaries. This requires careful inspection when purchasing bees or used equipment, and novice beekeepers will likely require the advice and assistance of those with more experience. Within an apiary, bees and comb should never be transferred from any diseased or weak hives into healthy ones.

Diagnosis: Open hives regularly to monitor their health. Learn to recognize the signs of AFB and be especially attentive to colonies which are failing to thrive. Any diseases or parasite issues should be dealt with promptly. Newer beekeepers can use the resources of their local beekeeping group, apiary inspector, or USDA labs in making diagnoses.

Control: Catching an infestation early and burning the infected hive or hives is the only way to eliminate it. Antibiotic medications registered for the control of AFB only mask symptoms of an outbreak, do not stop its spread, and suppress its signs only as long as they are used continually. They should not be used prophylactically. In order to minimize the spread of the infection to neighboring apiaries, consultation with state apiary officials is highly advisable. In some states it's required. It is important to do follow up inspections of surviving hives and to act promptly if further signs appear. Re-queen surviving hives with hygienic queens.

Thanks for a good question, and your thoughts.

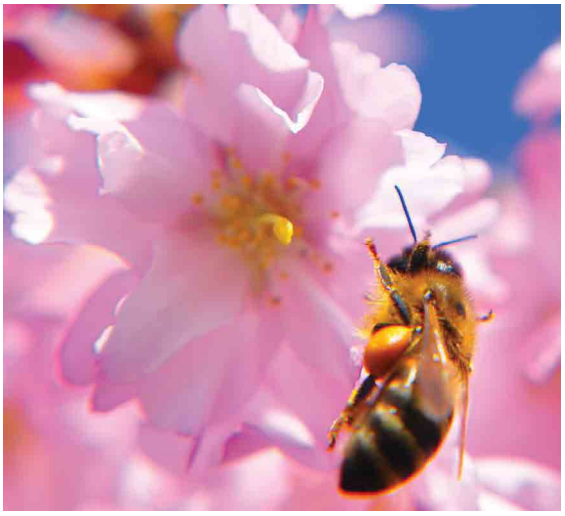
A beekeeper in Ohio writes:

Phil, ... [do] you know of anything that can be used on apple and cherry trees that is not toxic to bees. I have 17 hives here north of Dayton, OH and also have fruit trees. Most of what I've found is very toxic to bees.

Phil replies:

Though I am not a fruit grower, I have spent time with beekeepers who are, and have also heard horticultural extension specialists discussing the treatment of fruit trees for insect pests. It has made me very aware of the difficulty of killing insect pests in the orchard while not harming desirable insects. For answers to your question, I sought out some real experts on the topic at the University of KY: Dr. John Strang, Fruit and Vegetable Extension Specialist, and Dr. Ric Bessin, Entomology Extension Specialist, both of whom have experience as beekeepers.

For backyard apple growers, they recommended the use of oil and Bt (*Bacilllus thuringiensis*) as non-conventional chemical insect controls. Dormant or summer oils, mixed with water, are used to control insect pests by interfering with their breathing. They can be used in ways and seasons which make them safe for honey bees and other beneficial insects. I discussed Bt in a Q&A concerning wax moth control in the July 2014 issue of *Bee Culture*. It is a bacterium which is classified as a non-chemical, bio pesticide. There are a number of subspecies of Bt, each effective at killing a different, specific insect species. By targeting specific insect pests, Bt causes no collateral damage to pollinators such as



honey bees.

Other chemical options to protect apples from insect damage include the use of the pesticides Surround, and Entrust. The main ingredient in Surround is a type of clay called kaolin, which creates a non-toxic film barrier between the pest and its host plant. Kaolin is an edible mineral long used as an anti-caking agent in processed foods and in such products as toothpaste. Spinosad, the active ingredient in Entrust, is produced by fermentation of the fungus-like bacterium Saccharopolyspora spinosa, which was originally discovered in Caribbean soil. Spinosad is also available in many other pesticides. Entrust/spinosad is toxic to honey bees and other pollinators *during the spraying process and while the spray material is still wet.* Once spray residues have been allowed to dry for three hours or less the residue has low risk for honey bees. Both Surround and Entrust, as well as their ingredients, are considered organic approved. However, organic certification for growers is conducted at the state level, and regulations will vary state to state. If you are certified organic, or seeking organic certification, you need to consult the certification agency in your state.

A non-chemical alternative is to enclose apples in three-pound special paper bags once the fruit reach ¾ of an inch in diameter. Bagging can be very effective at excluding diseases and insects and avoiding the use of pesticide sprays in orchards with only a few trees. For more information on bagging apples, see: **http://www2.ca.uky.edu/entomology/entfacts/ef218.asp**.

Backyard cherry growers have fewer bee-safe insecticides available. Only the use of oil, Bt, and the pesticide Entrust, are recommended.

If you decide to use a chemical spray, controlling flowering weeds in the orchard will help to keep honey bees away during critical times for insecticide application. It is also very important not to spray insecticides during bloom. In commercial situations, where honey bees are brought in for pollination, hives need to be removed promptly at the conclusion of the bloom.

Since I live in KY, I sought the advice of extension specialists at the Univ of KY, however, all states have similar agricultural specialists. If you are growing fruit, you should get to know the specialists in your state. Your local county extension agents also work with both local growers and with beekeepers, and help with answers to your questions. Using my suggestions as a starting point, you should conduct your own research and consult local experts in OH. BC

It's Not Hard Being A Mentor

But You Need Guidelines

Ann **Harman**

Experienced beekeepers know that each colony has its own 'personality.' And it's ever-changing (remember all those drones that found that queen). The more colonies you see, the more you can learn about bees and their behavior. Therefore when your local association asks for mentors to assist the current newbees, volunteer to be a mentor. You will learn more about bees and make new friends (OK, maybe one or two exceptions). What? Your local association does not have a mentoring program? Now is the time to start one.

The East Cupcake Beekeepers Association has just finished their spring classes and I have volunteered to mentor three newbees. Just two would be better but some members cannot because of work and family responsibilities and some feel they do not know enough about beekeeping. Well, even if you have been keeping bees for one or two years you do know more than the newbee who has never had any experience. Try being an apprentice mentor this year. Next year you will be a more experienced mentor and ready to help and, of course, to learn more about bees and their behavior.

I gave my three newbees my contact information along with some 'do not call times.' I am not interested in listening to any questions, even about bees, at 6:00 PM while my supper potatoes are boiling over onto the stove. I also reinforced the information given to newbees during one of the classes: it is better to make one phone call with 10 questions than 10 phone calls with one question each.

Who are my newbees and what do I know about them? Not much, really. Since their bees have not arrived yet perhaps a short visit to each would be sensible – to check on their apiary site and that their equipment is all ready. We all live in bear country so the installation of a bear fence prior to bee arrival had been emphasized. Site choice, ready-to-use equipment and bear fence will certainly give the newbees a good start as well as a good chance to make their first year a success. So let's visit each newbee.

Lots of flowers could mean lots of pesticides.

The first is a recently retired man and his wife in a fairly rural area. Both attended the classes and asked sensible questions. As I pulled up to the house I noticed immaculate large flower gardens. They also have a huge vegetable garden and are planning to have a small greenhouse. Good signs? Well, I better ask about their use of pesticides on both the flowers and vegetables. If they are using various organic controls then all is well.

I just need to make a mental note – will these two beekeepers be the sort that needs to inspect every side of every frame from top to bottom of hive every week during bee season? I did not see a single weed in the lawn or flowerbed or vegetable garden. Attention to detail can be good but not if it interferes with the bees' life style. Will their bees suffer from constant disruption? A bit of over-inspection is fine for a newbee during the first year. Newbees are learning and we don't have Superman's X-ray vision to see through the wooden walls of the hive.

Their bear fence was elegant and useful. I found no fault with their site or equipment. I asked about pesticides and found they did not use any nor did they use fungicides or herbicides. In addition they did know their farmer neighbors who had cattle, not crops. So all in all (except possible overzealous inspection) these newbees seem to be on the road to success.

My next stop was a somewhat suburban area, pleasant with lots around eight to ten acres. While driving down the road I saw trees and gardens and thought it seemed a very nice area for bees. The newbee is a woman with two half-interested early-teen-age children. The children came to a very few classes but their mother attended all. The husband thought bees were just fine but he was too busy with work and the children's sports on weekends.

This visit was going to be a bit longer than I had initially thought. The next-door neighbor had a swimming pool. But supplying water for the bees will not be a problem. The former owner had made a small pond at the bottom of a gentle slope. However the newbee has chosen a poor site. The two hives had been placed next to the pond 'because they look so pretty there.' Our newbee must have slept through the part where the instructor had said a damp area was unsuitable.

The two children who had been assigned the bear

fence construction had put it only about two feet away from the hives. Not only would any eager bear have been able to reach the hives but also there was absolutely no room between fence and hives to work. So moving the site actually meant bear fence improvement also. The equipment was ready. The children had obviously found partly empty cans of paint because the hives were an assortment of colors – green, yellow, pink, orange, blue. No bees would ever get confused about their home hive until someone swapped hive bodies.

Inquiries about surrounding farmland and possible use of pesticides not only there but also in the immediate suburban area were unsuccessful. The newbee only had a few flowerbeds and haphazardly raised a few tomato plants each year and so did not bother to use any pest control. We will just have to wait and see. Emphasis on recognizing pesticide kill during the summer months will be important.

I spent so much time there that I will have to visit the third newbee on another day. Our third newbee lives in a much more urban environment. However, he had read about the problems honey bees were having and decided to keep just two hives 'to help the bees.' His co-workers in his office think it will be loads of fun and plan to help on weekends when they are not busy with something else. Several of them helped him set up his beeyard and bear fence. I need to keep in mind that these bees just might survive with what promises to be minimal help from the newbee. I think I will need to focus on swarm prevention if the two colonies survive their first year.

Since the East Cupcake Beekeepers Association sells four-frame nucs they can be picked up and installed on different days. I have arranged days and times of installation with the three newbees on three different days so nobody will be rushed. Each newbee has been told to have protective gear on, hive tool in hand and smoker lit when I arrive. They also know that they will be doing all the work and that I am only standing by in case of disaster. I do plan to coach them a bit if they seem a bit hesitant.

All three installations were successful. Nobody dropped a frame of bees. I reminded them to read their book and review their notes taken in class. We made appointments, weather permitting, for my next visit. At that time the hives will be opened to see the progress of the nuc. I encouraged the newbees to watch the entrance to see bees coming and going and see if any were carrying pollen. The nucs were strong and healthy so I did not expect any problems. I asked them to check the syrup feeders several days after installation. They all could do that easily by looking under the top cover without disturbing the bees.

All the package installations went fine.

The second visit went very well with all three newbees. The urban man's smoker went out but at least he got it started again. Fortunately all the bees were quiet and busy. All the newbees were initially very cautious but became more comfortable as they became fascinated with the bees. Yes, a marked queen was seen by all – great excitement. The two children, who did have veils on, were really interested and had dozens of questions. They might turn out to be beekeepers after all. Well, real bees are much more interesting than going to class.

At each place we reviewed their next major step – putting on a second hive body. In order to find out if they knew when, I had them tell me what to look for in the first hive body. All their answers were good, showing that they may have reviewed their notes. Because the urban area may have somewhat limited nectar coming in I encouraged our urban newbee to be sure the bees had plenty of syrup.

At this point I told all of them they were basically on their own. I was happy to answer questions over the phone or by email. I emphasized that I would be available for a beeyard visit if anyone suspected or found a problem or was having difficulty in 'what to do next.' They were all encouraged to attend the Association's meetings and field days. Since they are automatically members for a year (as class members) they receive the newsletter with meeting topics and dates. If I don't hear anything from them in the next six weeks I think I will contact them for a progress report and perhaps schedule a visit. I certainly hope their bees all survive the first year. That really is the best encouragement for continuing beekeeping.

My predictions for newbee survival at the end of five years: The retired man and his wife will have acquired three more hives and will be participating in the East Cupcake Beekeepers Association activities. (Officers? Most probably.) They will be in their second year of mentoring the association's newbees. The suburban family, with two colonies still, will have lost some colonies for various reasons, not disease, but replaced them during the five years. One of the children will still have some interest and will help out from time to time. On the whole they will seem to be doing well but still have questions from time to time. A bit difficult to predict their future. The office man—well the colonies will make it through the first year; one either will die or leave the second year (minimal information on when and exactly what happened). The second, and only colony left, will fizzle out after casting several swarms the third year. That newbee will be asked to donate his equipment (yes, if it is disease free) to the Association for a newbee to use. I believe he will take tennis lessons in place of beekeeping. He did mention tennis looked like fun.

Mentoring is only as successful as the new beekeepers are capable of becoming beekeepers. Mentors can help. Mentors will learn. We have to accept that not all people will become real beekeepers. BC

Ann Harman mentors new beekeepers from her home in Flint Hill, Virginia.

Sweet Science In The College Classroom

An Inquiry Into Honey And Pollen

Leah **Latshaw**

"What is honey?" "Why is it different colors?" "How is the honey produced by a local beekeeper different than the honey found in the store?" These and many more questions were asked recently by Capital University students enrolled in a course I teach titled Science by Inquiry. The course focuses on inquiry based learning in which students get to ask questions and develop methods to answer those questions all while the instructor supports the learning with materials and scientific methods. Students enrolled in the course are all majoring in education and plan to become elementary teachers, middle school teachers or intervention specialists after graduation. It was the students' questions at the beginning of the semester that led to the collaborative development of classroom learning experiences focused on familiarizing students with beekeeping, learning about current events, and then carrying out a simple pollen analysis using honey samples.

Beekeeping and local food are hot topics, even in non-beekeeping circles. When my students began asking beekeeping-related questions, an invitation was extended to Dr. Joe Latshaw of Latshaw Apiaries LLC. (It is convenient that Joe is my husband, and I think this helps him find time to work us into his schedule.) Joe came and spoke with the class about beekeeping and his extensive research of behavioral genetics and honey bees. It was motivating for the students to hear a professional beekeeper share about the science of beekeeping and also about the commercial beekeeping industry. This was also enlightening to the students who had no firsthand experience with beekeeping on either the hobbyist or commercial level. The presentation was supplemented with six hands-on learning stations prepared for the students where they could learn more about various aspects of beekeeping. Each station presented a question that the students could answer using the materials available at that learning station. For example, the question "What does honey taste like?" was asked at one station where numerous honey products were available for tasting, including comb honey and honey of different colors and floral sources. Students were surprised by the substantial differences in color, flavor, and texture that they had never noticed or paid attention to before. The five remaining stations also had their own unique questions:

How are queens, workers, and drones alike and different? Sample photos and diagrams were provided for each.

What is inside a bee hive? An active observation hive was available for students to study.

What does pollen look and taste like? Pollen samples were available for tasting. Prepared slides of pollen grains were viewed using a compound microscope.

What equipment is used in beekeeping? Numerous tools such as a smoker, hive tool, frames, and a small demonstration hive were on display.

How much more concentrated is honey than nectar? Three glass jars with lids were prepared ahead of time with sugar solutions of 20% (representing nectar), 50% (representing an intermediary), and 80% (representing honey).

To enhance understanding of the industry, students were encouraged to seek out current events articles related to beekeeping. The articles selected included topics such as honey smuggling, ultrafiltration of honey, and pollen identification. Students were challenged to keep asking their own questions related to their specific wonderings, and they were able to answer these questions with the help of many online resources. Classroom activities continued to be guided by students' questions. The focus of many questions centered around honey and what is actually in the honey we eat. As an instructor, my challenge was to develop appropriate classroom activities that could help students try to answer their questions, but were also manageable for the students to apply. When asking whether the honey they were eating actually contained pollen, it was apparent that a simple technique was needed for removing pollen from honey samples and examining it under a microscope. The goal for using a simple method was to eliminate the

Some of the various honeys chosen by students for the pollen analysis.

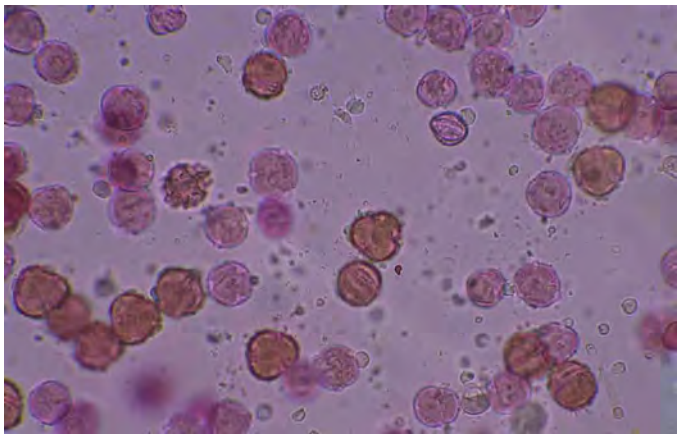
need for using potentially hazardous chemicals that would prevent the students from replicating the activity in a classroom with middle school or elementary students with just minor modifications. Students' curiosity about available honey sources led them to choose many different samples to include in the study. Some of the honey selected was labeled as local, raw, or organic. Other honey came from commercial honey packers and restaurants, primarily fast food establishments such at Popeyes, Kentucky Fried Chicken, and McDonalds.

In order to successfully examine the pollen, the pollen in the sample must first be concentrated and then stained to provide adequate contrast for viewing. While pollen contained in honey can be visible under magnification with no staining, it is beneficial to use a stain to make the pollen grains more readily visible for the students and to make the surface structure of the pollen grains more distinct. This was found to be most advantageous especially considering the low amounts of pollen found in some samples. To prepare the stain ten grams of gelatin were added to 35ml of distilled water in a glass beaker. The beaker was placed on a hot plate until the gelatin dissolved, stirring as needed. Next, 30ml of glycerin was added along with a few crystals of basic fuchsin stain to give it a rosy color. It was then poured into two sterile petri dishes. Once cooled, the plates were kept under refrigeration until needed. The stained gelatin was prepared in advance, and the two petri dishes that resulted were more than enough for preparing all necessary slides made in class.

The preparation of the slides required patience and appropriate equipment. Using methods adapted from Rex Sawyer, two slides were prepared by students for each honey sample they selected to analyze. First, clean slides were labeled for the appropriate sample being prepared. Students measured 10ml of distilled water into a small beaker. The beaker was placed on a hot plate until the water was warm but not boiling. Five grams of honey were added to the warm water and swirled until combined. Half of the sample was poured into each of two test tubes. These test tubes were centrifuged for a minimum of 15 minutes at a speed of 2,000rpms. After centrifugation, the test tubes were very carefully inspected for a small deposit of sediment near the bottom of the tube. It was found that some samples did not have a visible sediment and these were centrifuged a second time. It was often helpful to hold a white sheet of paper behind the test tubes to make it easier to see any sediment. When sediment was visible, a long sterile pipette was used to collect the sediment with as little of the solution as possible. This sediment was then gently spread onto the center of one of the previously labeled slides. This was done for each test tube, resulting in a total of two slides. Both slides were placed on a hot plate set to the lowest setting. This allowed the material on the slides to dry. Once dry, a small cube of the fuchsin stained gelatin was placed on the dry sample. The heat from the plate quickly melted the gelatin and the slides were immediately removed from the hot plate and covered with a coverslip. Now the slides were ready to be viewed using compound microscopes.

Andrew Rutsky studying a slide prepared from one of the honey samples.

Looking at the prepared slides under the microscope was intriguing. The first challenge was distinguishing pollen from what the students referred to as "debris." In some instances, the debris would also pick up the stain. Having resources available in the classroom with photos of common pollen grains was helpful, and students often used the irregular amorphous shape of the debris as a distinguishing factor. When pollen was found most students selected several random places on the slides at which to count pollen grains. For samples containing larger amounts of pollen, this method was successful in providing comparative data for the different honey samples. In a few cases, the students had so much pollen that great care had to be taken to accurately count all the grains. Most slides were initially analyzed at a magnification of 100x. Individual grains could be more closely studied at 400x. Photos were frequently taken to document student findings using a camera with a microscope eyepiece adapter.



Abundant pollen grains found by students in a honey sample (400x).

Students also discovered that some samples contained very little pollen at all. In these cases the students changed their approach and scanned the entire slide in search of any pollen grains. These pollen grains were then counted and photographed, often times individually.

Considering the variety of samples chosen by the students, it was no surprise that there was a great deal of variation in the results. This is okay, after all, it is the experience that is most important and for the students to see that science can be messy and unpredictable. It was exciting to see students really taking on the traditional roles of scientists – comparing results with other groups, questioning their own results, looking for sources of error, and trying to make sense of their data. The creation of two slides from each sample was helpful in checking data for reliability. In one case, considerable pollen was found on one slide while very little was found on another slide from the same sample. This led students to question their work and whether the slide with little pollen was actually prepared correctly. More practice preparing slides could help improve their skills and the overall reliability of the data collected. After quantifying the pollen, attempts were made to identify the source of the pollen grains present in the various honey samples. At first, students tried to use text resources provided in class. With so many initial similarities in the appearance of some of the pollen grains, a new approach was devised. A list of common flowering plants that would be visited by honey bees in central Ohio was constructed. Images were found online of the pollen grains from these plants. Students then compared their samples with the images from this list. This proved more successful in helping the students create positive identification of the pollen grains. It also reduced the frustration that was easily created by having students blindly searching for matching images. Of course it was still challenging to positively identify the pollen in samples that came from other locations. The honeys identified as monofloral were easier to investigate as images of the pollen from the monofloral source could be found online and then compared; much like was done with the other local samples.

Using inquiry in the classroom allowed students to ask questions about bees and honey that were interesting to them. We then collaborated to find answers to those questions. Armed with new information and a wealth of experiences, students were challenged to present their new knowledge in a culminating poster session where we were able to celebrate their learning. Students shared their results with their classmates and guest judges, Dr. Joe Latshaw and Mr. Dana Stahlman, a successful and well-respected beekeeper in the local area. Students also responded to questions from the knowledgeable judges that helped them better understand honey bees, the beekeeping industry, and even our culture as it relates to business and economics. During this poster session students also reflected on the learning process and how this process could be used in the future in their own classrooms. Many students noted their increased awareness as consumers of honey products and their greater understanding of the beekeeping industry in general. The entire experience was a terrific learning process for both the students and the instructor alike. It will be exciting to build upon these basic skills and continue to encourage students to seek out answers to the questions they have about bees and honey. BC

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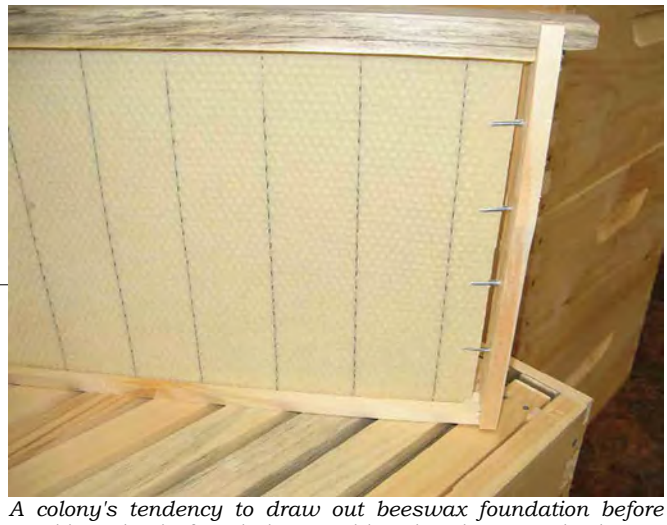
Need A Beekeeping Mentor? Why Not Ask The Bees

Ross **Conrad**



A colony's tendency to draw out beeswax foundation before touching plastic foundation provides the observant beekeeper with a clue as to which type of foundation is preferable to the bees.

Need a Beekeeping Mentor? Why Not Ask the Bees . . .

Many indigenous cultures around the world believe that everything in the natural world has something to teach us if we are open to it in our hearts and our minds. When it comes to beekeeping, our best teacher may well be the bees themselves. Here are just some of the lessons we can learn from the hive as a mentor.

Replace Old Comb Regularly

I we observe the hives of feral colonies we often find large bits of comb debris and wax moth refuse on the bottom of these cavities that house very large and healthy honey bee colonies. This supports the theory of the wax moth as Mother Nature's clean-up crew. When a hive dies out or becomes weak and is only able to occupy, patrol, and maintain fewer combs than they previously had, the wax moths move in and devour those exposed and unprotected combs. As the weak hive recovers and builds up its population, or a new swarm moves into the previously occupied cavity, new replacement combs are built to serve the colony. This natural cycle suggests the importance of regularly replacing the honey and brood combs in our hives. Regular comb replacement will help to limit the debilitating impacts that pathogen and pesticide residue build up in comb that can have a detrimental impact on the health of the bees over time.

Use Foundation Made From 100% Beeswax

Plastic foundation must be covered with a layer of beeswax in order to get the bees to build comb upon the foundation. Without the layer of beeswax, colonies will tend to build combs next to, but not on plastic foundation. Place both plastic and wax foundation in the same bee hive and the bees will tend to draw out the wax foundation before they touch the plastic foundation. Much is unknown about the impacts of plastic foundation and frames including the impact of the off-gassing chemicals produced by some plastics on bees and beeswax, and the ability of plastic foundation and comb to transmit vibrational signals through the comb during waggle dances. The honey bee's reaction suggests that while plastic foundation and frames may be convenient and desirable to many beekeepers, bees do not like plastic foundation and prefer foundation made from beeswax if foundation is to be used at all.

Feed an Artificial Diet Only As a Last Resort

Honey bees have evolved over millions of years to exist on a diet of fermented pollen and honey made from the nectar of plants or the sugary excretions of aphids. Provide a colony with a feeder filled with sugar syrup during a major honey flow, and the bees will take the syrup much slower than they do when there is no honey flow, if they take any of the syrup at all. This observation is a clear signal that bees prefer their natural diet over the artificial ones that beekeepers have a tendency to provide. This suggests that it may be a good practice to only feed bees when they are in danger of starvation and then, to use honey sealed in honeycomb is the first choice when deciding what to feed the bees. Personally, I will only feed syrup when a colony is in danger of starvation and I have no excess frames of honey to provide the bees. Even then, I will often fortify the sugar syrup with sea salt and herbs in order to try to make it more like nectar in the hopes that it will be more nutritious for our pollinator friends. Research that indicates honey bee genes related to immune response are activated on a diet of honey and pollen but not when their substitutes are fed suggest the beneficial impacts of an authentic honey bee diet over an artificial one.

Position Drone Comb on the Outer Edges of the Brood Nest

The culling of drone brood in order to remove reproducing *Varroa* mites from a colony is becoming a common practice among many beekeepers. Some beekeepers will replace a deep frame or two in the brood chamber with shallow or medium frames in order to allow the bees to build drone comb in the empty space below the shallow or medium frame's bottom bar. Once the drone comb is constructed, the queen has laid eggs in the comb, and the cells of developing drone brood are capped, the frames are removed and the drone comb attached to the bottom bar of the shallow or medium frames is removed. Beekeeping supply companies have responded to the interest in utilizing capped drone brood removal for the control of Varroa by offering plastic drone brood foundation coated with beeswax to their customers.

When we observe how colonies of honey bees build their comb and arrange their brood nest, we notice a pattern. The drone comb is almost always built on the outer edges of the brood nest or the outer edges of the frames of worker comb. If we are to embrace the concept of the hive as a mentor, we will duplicate this arrangement when we are placing drone comb in the colony. This means

Honey bees provide immediate feedback when we fail to work with them in a ways that ensures they don't become defensive. By not covering yourself in protective clothing and putting up a barrier between you and the bees, you will get a good indication if your presence irritates the hive or not."

that we will position frames of drone comb foundation or short frames to be used for culling drone brood, not in the center of the brood nest but on the outer edges of the brood area, just like the bees would normally do themselves.

Position a Majority of Winter Honey Above the Brood Nest

Just as the brood layout in a hive will tend to follow a predictable pattern, so will the layout of pollen and nectar within and around the brood nest. Brood is often found surrounded by a band of fermented pollen with honey off to the sides and above the pollen layer. This provides the beekeeper with a clue as to the best way to arrange winter food provisions within a hive to both ensure the hive does not starve over the winter and to avoid the necessity of feeding. By making sure that the majority of the honey within the hive is located above the brood nest as winter sets in, this creates a situation in which the wintering cluster should have plenty of honey available to them and the bees won't eat themselves into a corner and starve as they slowly migrate into the upper levels of the hive during the winter months.

Bees Don't Care What Type of Hive You Use

Anyone who has spent time observing feral colonies can't help but come to one obvious conclusion: Honey bees don't care about the shape of the hive they live in. Swarms have been found in all manner of cavities from abandoned vehicles and garbage cans, to tree hollows and the space between wall studs, roof rafters, and floor joists in buildings. Sometimes these cavities are oriented vertically and sometimes they are horizontal in shape. Sometimes the cavities they choose are round and sometimes they're square. As research conducted by Tom Seeley and outlined in a book that is destined to become an all-time classic volume, *Honeybee Democracy*, bees don't care about what type of hive they are kept in. Bees do seem to exhibit a preference for the size of the hive opening, the geographic orientation of the hive entrance, entrances that are close to the bottom of the hive cavity rather than the top, the over-all volume of the hive cavity, and the height of the cavity from ground level. The bees do not care if the hive is top bar, Warré, uniquely custom built, or a standard Langstroth model. They don't even care if the hive observes the rule of bee spacing or not. These differences are all designed to appeal to the beekeeper, not the honey bee. I've said it before and I'll say it again…it does not matter what kind of hive you keep your bees in, what matters is how you care for them. The bees tell us so.

Gauge Your Effectiveness by Observing Colony Behavior

Our mentor, the honey bee, can also tell us a lot about how effective we are as beekeepers when we are working with a colony. Are the bees aggressively attacking you while you work, or are they relatively calm and docile? This immediate and direct feedback can help you evaluate among other things whether you are using your smoker effectively, being too rough or clumsy with the colony, or are wearing a bee suit that is in bad need of washing.

Winter Survival: the Ultimate Confirmation

The most valuable lesson the hive can provide is one of survival. When a hive dies, it is providing a clear and unambiguous lesson in the appropriateness of one's beekeeping management skills prior to its death. The key here of course is to capitalize on the sacrifice the hive has made and take the time to try to figure out why the hive died and what you might change in order to prevent a similar occurrence from happening again. It is a sad but true fact that we tend to learn more from our mistakes than from our accidental successes.

The Best Mentor May Just Be a Bee Hive Away

Normally when we think of a beekeeping mentor, we often picture a more experienced beekeeper. The importance of having a mentor (or two) as you embark on your beekeeping adventures cannot be overstated. A good mentor is there to help you when you are confused, uncertain, or just plain dumbfounded. Whether you are just starting out or have 50 years of experience, trusting the hive as a mentor reminds us that the best possible results most often come from simply mimicking nature and the natural processes that occur around us. Even science itself has come to this realization with the prominent emergence of the field of biomimicry (aka biomimetics) which imitates the models, systems, and elements of nature for the purpose of solving complex human challenges (Wikipedia).

If you want to know what the bees prefer, or what works best for them, consider just asking the bees. They don't not mince words, or pull their punches. Through careful and thoughtful observation, the bees may be providing us with many clues regarding how to best care and provide for them. All we have to do is listen. BC

Ross Conrad is the author of Natural Beekeeping 2nd Edition. He will be teaching a two-day Organic Beekeeping for Beginners course May 9-10th, and an Advanced Beekeeping course on May 23rd in Lincoln, Vermont. For more information or to register visit ***http://www.mettaearth.org/*** *online or call Ross at 802-349-4279.*

GLEANINGS

APRIL, 2015 • ALL THE NEWS THAT FITS

OBITUARIES

Paul Hendricks born 3-18-1950, Toronto, Ontario, Canada; raised in Englewood and Littleton, Colorado; passed away 1-18-2015, Denver, Colorado.

Paul began keeping bees in 1976 as a bicentennial project. He built up from within his operation, as well as sharecropping others and purchasing other operations. At some point he crossed the line from hobbyist to commercial and eventually was running 1200 colonies, which was a lot for just a "mom and pop" operation. His wife, Linda, worked with him for most of their married life. When he was trying to get her to accept his marriage proposal, he promised life with him would never be boring. He kept that promise!

He was hard-working enough to leave most compatriots in the dust and when others were getting 50-60 pounds per colony, he would be pushing 100. But from his two queen colonies, he could get even more – he was one of only a couple guys in the state who knew how to run two queen colonies.

For Paul, keeping bees was more than a way of life; it was his passion. He taught a man from Uganda beekeeping techniques and sent him home with some equipment so the Ugandan could help an orphanage be self-sufficient. He was inexhaustible in his efforts to protect the bee industry, lobbying at the state level as well as the national level. He was also involved in strategizing for the fight against PennCap-M, Gaucho, and more recently, the neonicotinoids.

Paul was diagnosed with metastatic cancer the summer of 2013. In spite of chemo treatments and a couple of surgeries, in the end it had spread to his brain.

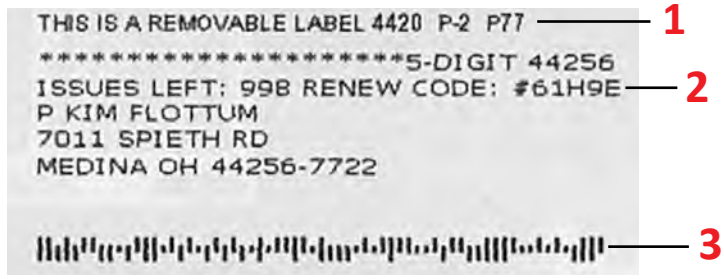
He is survived by his wife of 26 years, Linda, his daughter, nearly 22 and nearly a college grad, and two sisters, Faith Battle and Becky Jongeward. He will be missed.

Dr. Peter Teal assumed the role of Research Leader of the Chemistry Research Unit in 2003 and served in that position until 2015. In 2014, he also began service as Acting Research Leader of the Subtropical Horticulture Research Station, Miami, Florida.

Dr. Teal was a Supervisory Research Insect Physiologist, and he obtained both his B.Sc. and M.S. Degrees from the University of Ottawa and his Ph.D. in Entomology from the University of Florida. Dr. Teal began his career with ARS at CMAVE in 1990. Prior to that, he was an Assistant Professor at the University of Guelph from 1983 to 1986, and an Associate Professor at the University of Florida (1986 to 1990).

Dr. Teal was an outstanding scientist with an international reputation and had achieved the level of super grade. His research focused on isolation and identification of naturally produced compounds that affect the behavior and reproduction of insects and in developing control and monitoring strategies for control of invertebrate pests. He received many awards recognizing his research and leadership. In 1991, he received the USDA Outstanding Early Career Scientist Award. Later, Dr. Teal was recipient of the Arthur S. Flemming Award for Science (2002) and Researcher of the Year Award from the Florida Beekeeping Association (2005).

Dr. Teal was active in technology transfer efforts related to protecting plants and honey bees from devastating pests while protecting the environment. He worked closely with industry using CRADAs and MTAs such as developing a new attractant for small hive beetles, a significant pest of honeybees. In 2014, he received the South Atlantic Area Senior Research Scientist of the Year "For excellence in chemical ecology research and advancing the surveillance and control of agricultural insect pests." His research has been documented in over 200 scientific publications and patents.



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NEW THREAT FOUND FOR BRIT BEES IN THE WILD

A network of viruses, previously associated with managed honeybees, pose a widespread risk to bumblebees in the wild.

Researchers at Royal Holloway, University of London, uncovered multiple interconnected diseases that are threatening several species of bumblebee and the managed honeybee, essential pollinators of many agricultural crops and wild flowers.

They report in a study published in the Journal of Animal Ecology that previous research had only identified one virus, deformed wing virus, which had most likely spilled over from managed honeybees into wild bumblebee populations.

"Our results confirm a recent review of potential threats to pollinators, indicating that so-called honey bee viruses are widespread in wild bees," says Prof. Mark Brown from the university's Department of Biological Sciences.

"It is imperative that we take the next step and identify how these viruses are transmitted among honey bees and wild bees, so that we can manage both to reduce their risk of disease."

The research identified five viruses – black queen cell virus, deformed wing virus, acute bee paralysis virus, slow bee paralysis virus and sacbrood virus (all named for their effects in honey bees) from wild bumblebees and managed honeybees at 26 sites across Great Britain.

Some of these infection levels were highest in honey bees and for others they were higher in bumblebees. This suggests that some viruses are predominantly spread by honeybees, while others rely on wild bumblebees.

Dino McMahon of Queen's University in Belfast says the research findings are important because they indicate that many viruses can spread easily between pollinator species and, furthermore, that they can reach very high disease levels in wild bumblebees.

Prof. Robert Paxton of Queen's University says the university's previous research suggested that a key virus of the honeybee – deformed wing virus – spills over to infect bumble bees, probably via contact at flowers.

"We now find that other viruses may be doing the same," he says. "Yet our new findings also highlight just how little we know of bee parasites and the role they play in the decline of pollinators."

The study was funded by the Insect Pollinators Initiative, a joint venture of the UK's Biotechnology and Biological Sciences Research Council, Department of Food, Environment and Rural Affairs, the Natural Environment Research Council, the Scottish government and the Wellcome Trust, managed under the auspices of the Living with Environmental Change partnership.

Alan Harman

GLOBAL ORGANIC SALES TOP $72 BILLION

The global organic market has topped US$72 billion and now involves production from 43.1 million hectares of organic agricultural land.

At the same time, the number of organic producers reached a record two million, with the Research Institute of Organic Agriculture (FiBL) and the International Federation of Organic Agriculture Movements (IFOAM) reporting that in 2013, as in previous years, the countries with the highest number of producers were India (650,000), Uganda (189,610) and Mexico (169,703).

The FiBL-IFOAM study says 170 countries reported organic farming activities, up from 164.

Market research company Organic Monitor says the United States is the leading market with US$27.6 billion, followed by Germany (US$8.6 billion) and France (US$5 billion).

China was included in the data for the first time and immediately jumped into 4th place with organic sales of US$2.7 billion.

Australia has the largest organic agricultural area at 17.2 million hectares, with 97% of that area used as grazing. It is followed by Argentina (3.2 million ha) and the U.S. (2.2 million ha).

Some 40% of the global organic agricultural land is in Oceania at 17.3 million ha with Europe accounting for 27% or 11.5 million ha, and Latin America 15% or 6.6 million ha.

In 11 countries more than 10% of all agricultural land is organic.

Africa was listed as having 29% of the planet's organic farmers, second only to Asia with 36%.

In the United Kingdom, the Soil Association's organic market report shows sales of organic products increased by 4% in 2014, a year when both overall food prices and food spending fell.

Shoppers spent an extra US$2.2 million a week on organic products and the organic market exceeded US$2.9 billion, despite a 1.9% drop in food prices and a 1.1% drop in sales of food and drink overall.

Dairy products and fresh fruit and vegetables continue to be the most popular organic purchases. Some 27.9% of spending on organic products was is in the dairy aisles with yoghurt sales increasing by 13.8% and dairy sales increasing by 6.5%. By contrast, there was a 3% contraction of the non-organic dairy market.

Sales of organic eggs and poultry were up 15.8% and 8.2% and there were also sharp increases for a wide range of other products, including fresh fruit (up 6.4%), tea (up 13.7%), cereals (up 4.2%) and biscuits (up 7.2%). Sales of organic vegetables fell by 2%.

However, figures from the Department of Environment, Food and Rural Affairs show the area of land under organic management fell by 3.9% in 2014 to 575,349 ha.

The Soil Association says data from the government-funded Farm Business Survey shows the financial performance of organic farms outstripped that of comparable non-organic farms in the seven years from 2006 to 2013.

It says the analysis reveals an average annual advantage in this period of US$40-US$127/ha for organic farmers over their non-organic counterparts.

The mood in the organic sector is confident with 63% of leading businesses predicting growth in 2015 and 62% of these anticipating double-digit growth.

"These are positive times for the organic sector and we have good reason to believe current levels of market growth will be sustained in the long term," says Soil Association head of farming Liz Bowles.

"We are seeing once again that rewards are there for those that stick with organic, make great products and sell them well. The UK organic market is expected to grow steadily again in 2015 and should break the £2 billion barrier in 2016."

Alan Harman

With Bees . . .
Sometimes You Win,
Sometimes You Learn

APIMONDIA U.S. BID FOR 2019

Many factors are affecting our bees and their population. Pesticides, Varroa and colony collapse disorder (CCD) are more than headlines to us; they are a reality that we as beekeepers must address every day. From Africa to Alaska, from Russia to Rhode Island, beekeepers across the globe face similar issues. And while we may differ in how we raise or manage our bees (some treat, some don't; some feed, some don't,) we all have one thing in common - love of the honey bee.

Discussions on these and other related topics are the focus of the Apimondia Congress. This is why the United States has chosen to bid for hosting the Apimondia Worldwide Beekeeping Congress in 2019. Apimondia is the bi-annual congress of the International Federation of Beekeepers' Associations. The federation was founded in 1949, and has a mission of promoting the scientific, technical, ecological, social, and economic apiculture development in all countries.

One of Apimondia's main objectives is to provide a meeting for exchanging information, and engaging in discussions between beekeepers, scientists, honey producers, government agencies, technicians and those working for apiculture development. The most productive aspects of any scientific meeting are the conversations that take place between sessions, and the new professional connections and friendships that are formed. The United States Apimondia Scientific Program is engineered not only to provide forums for experts to share knowledge, but also to create opportunities for beekeepers from around the world to meet and exchange ideas, and return home with satisfying and unique memories. To accomplish this, our program will use diverse approaches to engage attendees with internationally renowned experts and researchers.

The program will feature:

- Symposiums, platforms, plenaries and keynote speakers.
- Lunch events to facilitate small groups to interact with speakers and experts.
- Roundtables, fishbowls and chat shows that encourage experts to interact with attendees on hot topics.
- Poster sessions to allow attendees to talk in person with presenters.
- Knowledge fairs to demonstrate new ideas, products, and methods.
- Hands-on workshops.

They selected Minneapolis as the host city for the Apimondia USA 2019 bid. Minneapolis falls in the heartland of the United States, and the heartland of its beekeeping operations. Commercial beekeepers travel to Minnesota each year to process their honey production, and prepare thousands of colonies for transportation across the United States. One highlight of the program is the opportunity to visit the University of Minnesota, which has maintained an internationally recognized research, teaching and outreach program on honey bees since 1918. The University of Minnesota is located in the heart of the top honey-producing region of the United States. The university's honey bee program is currently expanding with the creation of a Bee and Pollinator Research Lab and a Bee and Pollinator Discovery Center at the University of Minnesota Landscape Arboretum.

Visit the Apimondia USA Bid 2019 website to learn more (http://www.apimondiausabidfor2019.org/) about how you can help bring the worldwide beekeeping community to the USA for Apimondia XLVI in 2019.

BEE RESEARCH TO RECEIVE $100,000 CONTRIBUTION FROM COBANK AND AMERICAN AGCREDIT

The beekeeping industry's battle against its leading insect nemesis is set to receive a boost, thanks to a recent $100,000 contribution from two of the state's largest agricultural lenders. The grant, from CoBank and American AgCredit, will fund research that will provide growers with healthier bees resulting in better pollination and increased crop yields.

The research is being conducted by Project Apis m., a non-profit organization that serves as a conduit between bee industry researchers and funding sources, which will use the donation to fund research into potentially new and innovative ways to control the Varroa mite. The pest, which weakens honey bees, reproduces quickly, and is capable of quickly spreading viruses within a bee colony, has grown to be a formidable threat to the bee industry since its discovery in the U.S. in 1987.

CoBank provides loans and other financial services to agricultural cooperatives and other agribusiness providers across the United States, including many in California. It is also the funding bank for Santa Rosa-based American AgCredit and other Farm Credit associations serving farmers, ranchers and growers throughout the state.

"We're delighted to partner with American AgCredit in search of a solution to this major problem," said Leili Ghazi, Western Region president for CoBank. "The mission of Farm Credit is to stand behind agriculture and the U.S. rural economy, and we hope the knowledge and insight gained from this research will reduce the threat to bee colonies on which so many producers depend."

"For this project, we're not only going to solicit scientists within our normal honey bee research institutions, but we're going to approach entomologists who might be working on other pests, particularly mites in other agricultural or livestock areas," says Christi Heintz, executive director of Project Apis m.

"The health of our insect pollinators is crucial to our farmers and to the American public," said Rep. Jeff Denham, co-chair of the Congressional Pollinator Protection Caucus. "We must work to understand what's causing the decline in health of our honey bee colonies. I look forward to seeing the funding for this research help us meet that goal."

CDFA'S NEW WORKING GROUP

The California Department of Food and Agriculture (CDFA) has initiated the "Healthy Pollinator Working Group" to develop strategies for improving pollinator health in California. The group consists of state, federal, and local agencies, agricultural growers, conservationists, researchers, managed bee keepers, and others concerned with pollinator health. At the first Steering Committee meeting Bob Curtis, Associate Director, Agricultural Affairs, Almond Board of California, said, "It's critically important this workgroup identifies areas CDFA can truly impact and thereby distinguish itself from the multitude of other pollinator workgroups." Hopefully the workgroup's deliverables will include improving access to state lands, clarifying border issues, and furthering emphasis on pesticide applications and registrations as they relate to pollinator health.

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CALENDAR

♦INTERNATIONAL♦

Apimondia International Apicultural Congress will be held in Daejeon, Korea September 15-20 at the Daejeon Conven tion Center.

For more information the official website is **www.apimondia2015.com**.

♦COLORADO♦

The Colorado State Beekeepers Association will be held June 13 in Rifle/Silt.

The featured speaker is Maryann Frazier.

For more information visit **www.coloradobeekeepers.org/summermeeting2015/**.

The Colorado State Beekeepers Association will host the Western Apicultural Society conference in Boulder October 1-3.

For details visit **www.coloradobeekeepers.org/western-apicul...ty-was-meeting/**.

♦CONNECTICUT♦

Back Yard Beekeepers Association 2015 Speaker Schedule – April 28, Sam Dorege Honey Bees In Perspective; May 26, Wyatt Mangum subject TBD; June 30: Dinner Meeting; September 29, Sam Comfort subject TBD; October 27, Juliana Rangel Posada on the Reproductive Biology of Honey Bees; November 17, Michael Fairbrother of Moon Light Meadery on Mead.

Each month we have timely weekend hands on inspection workshops, bee school, mentor program and more. For dates and locations and more information please visit **www.backyardbeekeepers.com**.

♦ILLINOIS♦

The 2015 IL State Beekeepers Association Annual Summer Meeting will be held June 27 in Effingham.

For information visit **www.ilsba.com**.

♦KANSAS♦

Northeast Kansas Beekeepers Funday – June 6 at Douglas County Fairground, Lawrence.

Marla Spivak, Marion Ellis and Chip Taylor will be the guest speakers.

For information visit **www.nekba.org**.

♦MINNESOTA♦

Bee Symposium - Keeping Bees Healthy, May 9 at University of MN.

Marla Spivak will be the keynote speaker. Other speakers include Christine Casey, Brian Johnson, Elina Lastro Niño, Amy Toth and Neal Williams. Admission is $75/person, $15/students.

For more information go to **www.honey.ucdavis.edu/events**.

♦MONTANA♦

Master Beekeeping Certificate endorsed by MT State Beekeepers Association; The American Honey Producers Association and Project Apis m.

For more information visit **www.UMT.EDU/BEE**.

♦NEW YORK♦

The Long Island Beekeepers Club will host Allen Hayes "The Gadget Guy," April 26 at the Frank Brush Barn, 211 E. Main Street, Smithtown from 2-4p.m.

For information visit **www.longislandbeekeepers.org** or 631.265.8249.

The Champlain Valley Beekeepers will hold their annual meeting April 25, 9-3.

Guest speaker will be Tom Seeley. Bring your lunch.

For details contact Dick Crawford 518.561.7167.

♦OHIO♦

Medina County Beekeepers Association meets the third Monday of the month at the Root Candle Company in Medina, OH. The meeting starts at 7:00 p.m.

April - Larry Connor
May - Jim Thompson
June - Field Day
September - Phil Craft
October - Dave Duncan and Ellen Harnish

For more information visit **www.medinabeekeepers.com**.

The Ohio State University Bee Lab Webinar will hold Kim Flottum, April 15 - Honey Bee Nutrition; Jim Tew, May 20 - American Foulbrood; Joe Raczkowski, June 17 - Social Insects; Reed Johnson, July 15 - Effect of Tank-mix Pesticide Combinations on Bees.

For more information contact Denise Ellsworth, **ellsworth.2@osu.edu**.

Geauga County Beekeeping Association will hold a beginning beekeeping workshop April 22, 7-9 p.m. at Kenston Middle School, Art Room 231, 17425 Snyder Road, Chagrin Falls. The instructor will be Dale Olson.

For more information visit **www.kenstoncommunityed.org or call 440.543.2552**.

♦PENNSYLVANIA♦

The Capital Area Beekeepers' Association will hold their 28th Annual Short Course May 2 and 9. The first class will be at the Dauphin County Agriculture & Natural Resources Center, 1451 Peters Mt. Road, Dauphin 17018 at 8:00 a.m. The second class start at noon at Dave Anderson's Apiary, 7081 A Colebrook Road, Palmyra 17078.

The cost is $40 which includes CABA membership.

For more information contact John Novinger, 717.365.3215 or **jdnovinger@epix.net**.

♦TENNESSEE♦

Adventures In Agriculture will held April 11, 10:00 a.m. to 2:00 p.m. and Lane Agri-Park, 315 John R. Rice Blvd., Murfreesboro.

It is free and open to the public.

For more information contact Charlotte Peay, **peaybrain14@gmail.com** or 615.896.0737.

♦VERMONT♦

Organic Beekeeping For Beginners will be held May 10-11 or May 17-18 at Metta Earth Institute Center For Contemplative Ecology, 334 Geary Road South, Lincoln. To register call 802.349.4279.

The cost is $110/person which includes *Natural Beekeeping* book. Ross Conrad will be the speaker.

Advanced Organic Beekeeping will be held May 24 at Metta Earth Institute Center For Contemplative Ecology, 334 Geary Road South, Lincoln. To register call 802.349.4279.

The cost is $50/person. Ross Conrad will be the speaker.

♦WASHINGTON♦

Washington State Beekeepers Association Beginning Beekeeping/Apprenticeship Course offered by Centralia College will be held March 31 - May 5.

Tim Weible will be the instructor.

To register call 360.736.9391.

♦WISCONSIN♦

Beginners Classes April 11 and May 2 at Dane County UW Ext Bldg., 5201 Fen Oak Dr., Madison.

2nd Step Class will be March 21.

For more information contact Jeanne Hansen, 608.244.5094 or **jeannieala beannie@yahoo.com**.

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Keeping Them Alive

Ed **Colby**

"Why don't you just send all your bees to California for the almonds," Marilyn wondered. "Then you'd have the Winter off." Maybe my gal was onto something. Just get on the gravy train. I only send the cream of the crop. Ten frames of bees minimum, in November – Paul's rule. He ships truckload after truckload. I tag along. This is the second year I've done this, the second year I sent 40. Last March, 38 came back, nearly every one begging to be split.

This year I could have sent more, but life's little complications got in the way.

My bees that wintered here in Colorado didn't fare so well. They never do. And it's not yet March, the cruelest month. March, the winnowing time, when the strong prosper and the weak perish. How is it that bees make it through December and January, only to dwindle and vanish in March? So Marilyn's idea intrigued me. Combine weak colonies to make strong ones, and send them all to the Promised Land for the Winter. Let Derrick take care of them out in the Central Valley or wherever it is they go out there. Then make splits when they come home. And cash my pollination check. Don't forget that.

The home bees get so needy. I put them on pollen supplement in late January. They can't get enough of it. They powered through honey stores this balmy winter. A measly 30-some colonies keep me busy, and broke.

You would have thought they'd be relatively mite-free after the grab bag of treatment tricks I threw at them through the Fall and Winter: thymol, Amitraz, formic acid, oxalic acid. Colonies got different treatments, but that apparently didn't matter. I tested four hives last week. Everyone has *Varroa*. Do you think almond pollination is a bad idea? Do you believe "they come back riddled with mites," as I once told a reporter? Look, if I send my bees to the almonds, they come back with mites. If I leave them here, they get mites. It's not a perfect world. You heard the horror stories about almond crop dusters and toxic tank mixes? You might need Lyle to broker your bees. He's old school, and the bees come first. The growers need our little darlings. Why would they cross Lyle?

Maybe I should go with them to California. Lyle remarked that the almond bloom is something every beekeeper needs to see. Maybe I could make myself useful and not just be in the way. When I dream of the almonds, I can't get Judy Collins out of my head. She croons her haunting ballad about leaving home to follow her rodeo cowboy. "Someday soon, goin' with him, someday soon . . ."

The nasty good California rockabilly band Cracker played an outdoor Valentine concert in Aspen last night, right at the base of the ski hill. Marilyn and I swayed to the music, danced on the snow. I still had my ski patrol pants on. She pulled on my heartstrings when she looked up at me with shining eyes. She's such a sucker for Valentine's Day. And it tugged on my heartstrings again when Cracker sang a sweet song of longing with the line "back to the almond groves." It made me think of my little darlings in the land of milk and honey. Someday . . .

We beekeepers have it made. As the world around us spins into chaos, all we have to do is keep our bees alive. That's it! Got bees? Lucky you! Honey prices hover just under the stratosphere. Bees equal honey equals money, and the world's a better place. You could be rich, especially when the almond growers write the big checks. And the more bees you own . . . All you need to do is make some splits. So why is keeping bees alive so hard? Last May I had 120-plus colonies. Now I count maybe 75. Where did they go? European foul brood and chalk brood cripple my colonies. American foul brood rears its ugly head. I run out of replacement queens. Queens die, or won't put out, and I throw those hives onto good ones. Starvation sneaks up on me. Relax, and *Varroa* mites eat my bees alive. My operation slowly dies from a thousand cuts. The world tips its hat to the beekeeper. Our task is so noble, so daunting. How do we do it? "Isn't it true the bees are dying?" everyone asks. I never know what to say. I know that I somehow keep going. When I have a bad year, I buy more bees from a better beekeeper. You can always tell the better beekeeper. He doesn't buy bees. He sells them.

Is beekeeping sustainable? I'm not even sure what "sustainable" means. Sustainable for me, in my lifetime? For 100 years? For eternity? I only know that, like honey bees, some beekeepers thrive, while others flounder. In the teeth of persistent and ominous drought, successful beekeepers send their bees to the almonds, and they bring them back stronger than they sent them.

I know that you can learn from the best and the brightest, but you need to figure things out on your own, too. I know that bad advice is as plentiful as good. There are a thousand ways. Do you have a better one? I hope you do! Did you read about it in a book? Did it come to you in a dream? Wonderful! But be wary. Dare to doubt. Honey bees will confound you every time. Beliefs you hold dear need testing in the white heat of the bee yard. The test is simple: Can you keep your bees alive?

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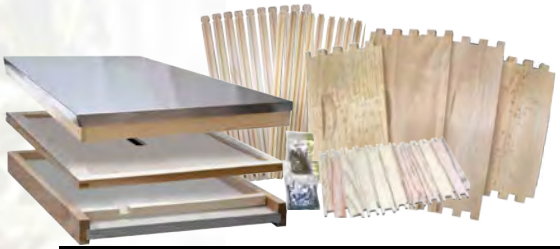

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