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MAY 2017



W.A.S.

Journal

Journal of the Western Apicultural Society of North America



Dr. Eric Mussen makes a point at one of the dozens of field days he has attended in the course of his career. See "In the Bee-ginning..." page 12. (Photo by Kathy Keatley Garvey, who titles it "Conducting the Orchestra")



Helping Honey Bees Thrive

2017 Bayer Bee Care Community Leadership Award

The 2017 Bayer Bee Care Community Leadership Award recognizes a partnership between a beekeeper and a grower, researcher, golf course superintendent or other stakeholder whose collaboration protects pollinators and benefits their community. The winning partners will be awarded a \$5,000 prize to continue their valuable collaborative work with bees in the community.

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The award winners are selected from a pool of applicants by a panel of judges.

The timeline for the 2017 process is as follows:



May 19

Deadline for applications

June 16

Notification to award winner

Week of June 19

Awards ceremony

To review application requirements and expectations of the award winner, download an entry form, and meet former award recipients, please visit <https://beehealth.bayer.us/beekeepers/community-leadership-award>.

Enter online or return your application by mail or electronically to:

Bayer CropScience LP
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P.O. Box 12014
2 T.W. Alexander Drive
Research Triangle Park, NC 27709
Phone: (919) 549-2000
Email: Becky.Langer@Bayer.com



MAY 2017



W.A.S.

Journal of the Western Apicultural Society of North America

Journal

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Western Apicultural Society of North America

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PRESIDENT'S MESSAGE ...

Spring 2017

It seems like it is still winter in some respects (still raining and muddy in California), but it is spring and the bees know all about spring. The weather turns warm, all sorts of trees, shrubs and flowers come into bloom and put on quite a smorgasbord for the bees. However, don't be fooled. Just when the bees are rearing brood very energetically, there are locations where the blossoms suddenly become non-existent and the bees require feeding before the next flow begins. Please keep an eye on how things are progressing with your colonies.

Things are coming along pretty well for the upcoming WAS conference. I finally rounded up the folks who are willing to serve as members and chairs of the committees that are listed in our bylaws. The committee tasks are listed in the bylaws as well, but I added a few more for the auditing and resolutions committees. The resolutions members are going to suggest ways that we can govern ourselves more efficiently and effectively. Those suggestions will be brought to the members for voting at the next business meeting of the general membership.

For those of you who do things well in advance, I should tell you that Archie Mitchell is the Chair of the Awards Committee. He will be receiving the nominations of candidates for our "Outstanding Service to Beekeeping Award" (wide open) and our "Thurber Award for Inventiveness" (usually confined to the state or province in which the conference is being held). If you have a favorite candidate, please submit his or her name, with detailed supporting information before the registration cutoff – July 31, 2017. Archie's email is: "Archie Mitchell" <archibald_178@hotmail.com>.

Program

We have most of the speakers lined up and the topics are going to be quite varied. Kim Flottum, of Bee Culture, will share some of his insights on the "Rapidly Changing Bee Scene." There will be speakers on colony management, including Les Crowder, co-author with Heather Harrell, of the book: "Top-Bar Beekeeping: Organic Practices for Honey Bee Health. Les will be discussing managing honey bee colonies in top-bar hives.

There will be an off-campus tour to a major beekeeping supply company and sugar syrup supplier, a visit to the UC Davis Bee Biology Facility and to the Häagen Dazs Bee Haven Garden. A number of presenters will have additional mini-sessions outdoors at Bee Biology on Thursday afternoon: various types of bee hives (containing colonies), diagnosing *Nosema* or *Varroa*, native bees foraging in screen houses and in the field, preparing bee samples for molecular studies, selecting plants for bee food, and more.

For those who wish to hear more in-depth beekeeping fundamentals, Dr. Larry Connor will be visiting with us. Participants will be given the option of attending the local, off-campus tour on Wednesday after lunch, or attending Larry's session for an additional \$50 per person. That option is available on the registration form. Larry's presentation will be: "Keeping Your Bees Alive and Growing." It will be a three-part session, including: 1) The Numbers Game – Understanding Honey Bee Reproduction; 2) Making and Using Increase Packages; and 3) Managing Colonies for Sustainability – Location, Genetics and Nutrition. Larry also is the founder and owner of Wicwas Press, and he will have a variety of books for review at the conference. Other speakers have been mentioned in my previous President's Message.

I am going to try to convince representatives from the major ag chemical companies to share with us their techniques for determining toxicity and risks to honey bees of using their products around apiaries. This is not meant to be an open attack on the companies, and I will be moderating the panel tightly. Protesters will be kept outside. Questions to the panelists will be screened through me. We are looking for the truth behind the research and development scenes, not for an opportunity to throw rocks. However, I am not inhibited about asking pointed questions on experimental design and experimental protocol. You might be pleasantly surprised at what you hear.

Tee-shirts

I located a superb artist within the UC Davis system to create our conference emblem. He created a whimsical design featuring the honey bee, a penny farthing, and the conference info. It is a black and gold pattern on a white, crew neck, T-shirt. The image can be reviewed on page 8 of this WAS Journal issue.



2017 President Dr. Eric Mussen

Accommodations

We thought that it might be a good idea to list the motels in Davis, so that you can get your reservations in early. If you go on the web and check any of the trip-helping sites, you will find that we have only 10 motels from which to choose. With the exceptions of La Quinta Inn & Suites and Econolodge, most of the venues charge between \$132 and \$165 per night. The property on the edge of campus (Hyatt Place) has the highest rate. Many are within “hiking” distance of the campus, but I strongly suggest purchasing a 4-day campus parking permit. Those permits are good in nearly all campus lots. Parking on any city streets within a mile of the edges of campus is controlled by residential parking permits. Lastly, I would suggest that you find lodging at a motel that provides breakfast. There are breakfast places on campus, but they are pretty busy in the morning (in fact, at all meal times).

According to tripadvisor for each night of September 5-8:

Hyatt Place (on campus edge)	\$199	Free Kitchen Skillet breakfast	530-756-9500
La Quinta Inn & Suites	\$115	Free BrightSide breakfast	530-758-2600
Hallmark Inn at UC Davis	\$140	Free warm breakfast	530-753-3600
Best Western University Lodge	\$132	Black Bear Restaurant next door	530-756-7890
Best Western Plus Palm Court Hotel	\$149	“Restaurant on site”	530-753-7100
Holiday Inn Express & Suites Davis	\$158	Free breakfast	530-297-1500
University Park Inn & Suites	\$149	Free continental breakfast	530-756-0910 SOLD OUT
Days Inn Davis	\$159	Free breakfast	530-792-0800
Aggie Inn (Ascend Member)	\$165	Free deluxe continental breakfast	530-756-0352
Econolodge	\$ 82	Free continental breakfast	530-756-1040

If for some reason you don’t find a motel in Davis to your liking, there are more in the town of Dixon, five miles away to the south, and Woodland, 11 miles away to the north.

I will keep pursuing the unfinished tasks and try to provide you with an enjoyable and educational visit to Davis during the first full week in September.

Eric Mussen

WAS President 2017



2017 Conference venue: the Activities & Recreation Center at UC-Davis.

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1 - Note et al. Efficacy of Apivar on the Varroa Mite, Varroa destructor in Alberta, Canada, 2012 Canadian Pest Surveillance Branch, Research and Innovation Division, Agriculture and Rural Development
2 - National Management Survey Bee Informed Partnership 2015 (S24)

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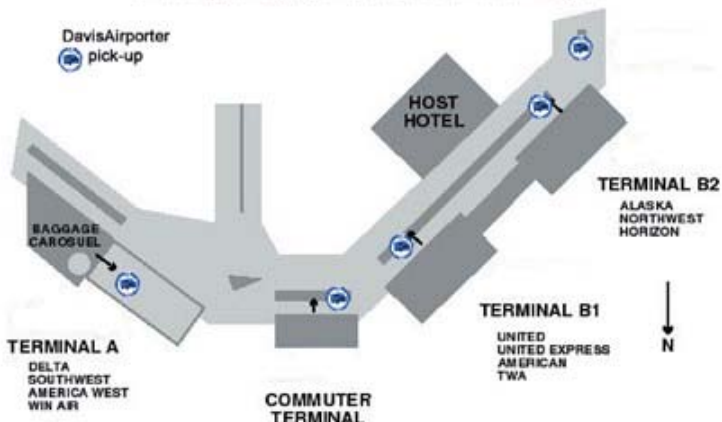
- 1978 Norman Gary (California)
- 1979 Lucien Alexander (Oregon)
- 1980 Randy Barker (Br. Columbia)
- 1981 Charles Duncan (California)
- 1982 William P. Nye (Utah)
- 1983 John Edwards (Washington)
- 1984 Eric Mussen (California)
- 1985 Mike Burgett (Oregon)
- 1986 Doug McCutcheon (British Columbia)
- 1987 Tom Muncey (Nevada)
- 1988 Dan Mayer (Washington)
- 1989 Stan Williams (California)
- 1990 Mark Shelton (California)
- 1991 William P. Nye (Utah)
- 1992 Mike Burgett (Oregon)
- 1993 Mark Winston (Br. Columbia)
- 1994 James Bach (Washington)
- 1995 Eric Mussen (California)
- 1996 Russell Messing (Hawaii)
- 1997 Eric Erickson (Arizona)
- 1998 Steve Sheppard (Idaho)
- 1999 Leonard Joy (Nevada)
- 2000 Fletcher Miller (Alaska)
- 2001 Mike Burgett (Oregon)
- 2002 Eric Mussen (California)
- 2003 Jaquie Bunse (British Columbia)
- 2004 Jerry Bromenshenk (Montana)
- 2005 Steve Sheppard (Washington)
- 2006 Adrian Wenner (California)
- 2007 Diana Sammataro (Arizona)
- 2008 Mark Pitcher (British Columbia)
- 2009 Eric Mussen (California)
- 2010 Dewey Caron (Oregon)
- 2011 Jenny Bach (Hawaii)
- 2012 James K. Smith (Washington)
- 2013 Melanie Kirby (New Mexico)
- 2014 Jerry Bromenshenk (Montana)
- 2015 Beth Conrey (Colorado)
- 2016 Ethel Villalobos (Hawaii)
- 2017 Eric Mussen (California)

Traveling to Davis

Flying in?

Sacramento International Airport is the closest to UC Davis, about 30 minutes from campus. We recommend contacting a local cab company or the DavisAirporter shuttle service at 530-756-6715 or 1-800-565-5153, shuttle@davisairport.com or <https://www.davisairporter.com/index2.html>.

Shuttle pick-up points at Sacramento Airport



Train and bus service

Go to <https://www.amtrak.com/california-train-routes> to find Amtrak routes and fares to Sacramento.

Go to <http://www.yolobus.com/routes/index.php/42A> to find Yolobus routes and fares from Sacramento Airport to UC Davis. *Please note: Regional Transit lines do not service the Sacramento International Airport.*

Directions to find the campus and the Arts and Recreational Center where the conference will be held will be in the next Journal, along with instructions about parking.

WAS Conference 2017 Tee-shirts




ORDER (on Registration Form, page 10) by **JULY 31**

Can't attend the conference? You can still order a tee-shirt. Additional shipping & handling will be required.

8 May 2017



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WESTERN APICULTURAL SOCIETY OF NORTH AMERICA
40TH ANNUAL CONFERENCE
Davis, California – September 5-8, 2017
REGISTRATION FORM

Name(s) _____
As desired on name tag(s)

Mailing Address _____
Street / Box Number

City, State or Province _____ Zip/Postal Code _____

Phone Cell/Mobile _____ Home _____ Email _____

CONFERENCE RATES	Cost per person	No. of persons	Total
------------------	-----------------	----------------	-------

Full Conference Package

(Bee Buzz, speaker sessions, beverage breaks, honey tasting, and two buffet lunches)

Full pre-registration (by July 31 st , 2017)	\$ 175.00	x _____	=	\$ _____
Delayed registration (after July 31 st)	\$ 225.00	x _____	=	\$ _____
Single day registration(s) – provide number(s)	\$ 60.00	x _____	=	\$ _____
Tues _____ Wed _____ Thurs _____ Friday _____				

Intending to be at the Bee Buzz? _____ “Yes” How many? _____ “No”

Optional 4-day Parking Permit(s) \$ 40.00 x _____ = \$ _____

Buffet Lunches – show lunch numbers and select beverages, simultaneously

Wednesday: Sandwich Buffet: Various breads, cold cuts, cheeses, salads, fruits and dessert

Beverage (#): _____ water; _____ lemonade; _____ mixed canned sodas; _____ coffee; _____ tea

Thursday: Salad Buffet: Four salads, bread sticks, fruit, and dessert

Beverage (#): _____ water; _____ lemonade; _____ mixed canned sodas; _____ coffee; _____ tea

Optional Event

Banquet Buffet - \$50.00 per person

Choice (show number): Chicken Marsala _____ Fresh-cooked Veggie Lasagna _____ \$ _____

Optional Event – At \$50 per person

Dr. Larry Connor: “Keeping Your Bees Alive and Growing” x _____ = \$ _____

Crew neck T-Shirts (see design example on page 8 in May WAS Journal)

Size: Small _____, Medium _____, Large _____, XLarge _____, XXL _____ = \$ _____
\$ 18 \$ 20 \$ 20 \$ 22 \$ 25

WAS ANNUAL DUES (U.S. funds) – membership not required for attendance at conference

Individual	\$ 20 _____	Junior (age under 21)	\$ 15 _____		
Couple	\$ 30 _____	Senior (65 or over)	\$ 15 _____	=	\$ _____
Individual 10 year	\$200 _____	Senior Couple (one over 65)	\$ 20 _____		
Couple 10 year	\$300 _____	Association/Club	\$ 20 _____		
Commercial	\$100 _____	Benefactor	\$500 _____		
Patron	\$1,000 _____	<i>Please attach membership form from WAS website.</i>			

TOTAL PAYMENT _____ \$ _____

Early registration forms and payments must be postmarked no later than July 31, 2017.

Payments in U.S. funds only. Check or money order made out to Western Apicultural Society.

MAIL TO: WAS Treasurer, Sherry Olsen-Frank, P.O. Box 5274, Twin Falls, ID 83303-5274.

OR register online at www.westernapiculturalsociety.com/conference via Paypal with a credit card.

Full refund if cancellations received by August 15, 2017. No refunds after that date or for no-shows.



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In the Bee-ginning

Kathy Keatley-Garvey, UC Davis

When the Western Apicultural Society (WAS) returns to its roots--the University of California, Davis--for its 40th anniversary conference on Sept. 5-8, at the helm will be a familiar face: co-founder Eric Mussen, who is serving his sixth term as president since 1984.

WAS, which serves the educational needs of beekeepers from 13 states, plus parts of Canada, was founded in 1977-78 for "the benefit and enjoyment of all beekeepers in western North America," said Mussen, who retired as Extension apiculturist in 2014 after a 38-year career. As emeritus, he continues to maintain an office on the third floor of Briggs Hall, UC Davis Department of Entomology and Nematology.

The organization was the brainchild of apiculture professor Norm Gary (UC Davis faculty, 1962 to 1994), who patterned it after the Eastern Apicultural Society (EAS). Gary participated in the EAS meetings as a graduate student at Cornell University, Ithaca, N.Y., where he received his doctorate in apiculture in 1959.

"We grad students were encouraged to attend and speak at the meetings," Gary related. "It was a wonderful opportunity for us to become acquainted with hobby beekeeping and to get public speaking experience as we reported research results at the meetings. Much of the success of EAS can be attributed to keeping expenses reasonable by using housing and services of university campuses during the summer, and taking advantage of the support provided by bee research faculty on those campuses."

In 1977, Gary asked Mussen and Becky Westerdahl, then Gary's postgraduate research entomologist and now an Extension nematologist at UC Davis, to help him launch the new organization. Gary obtained the bylaws and other documents from EAS to use as a model. EAS also loaned WAS \$1000 to support the fledging organization. The first fundraising project: a banquet dinner held at the Putah Creek Lodge, UC Davis. "I provided some really good honey beer that I was making at the time," Gary said, "and I contacted several wine companies for gratis cases of mead."

"The caterer was late in delivering dinner but no one minded because the wine and beer flowed freely," Gary recalled. "We were significantly 'relaxed' by the time dinner was served. Consequently, the after-dinner auction for miscellaneous beekeeping items was the high point of the evening. Bidders bid high. Owing to the wine and beer party, combined with the determination to raise enough money to start WAS, the auction was a wild, exciting event in which bidders were paying huge bucks for everything. We raised enough money to repay EAS and still have enough to move forward. Our first official WAS meeting was held the following year. It was hugely successful."

Gary served as the founding president in 1978; Mussen, vice president, and Westerdahl, secretary-treasurer.

"These activities perfectly complemented his extension beekeeping program," Gary said. "I participated for a few more years and gradually needed more time and energy for research and other activities. Eric has been a recognized leader since the beginning days, and he is still providing great support for WAS."



Mussen, Westerdahl and Gary masterminded the first WAS conference

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Mussen was elected president six times: 1984, 1995, 1997, 2002, 2009 and 2017. In addition, he has held the office of vice president six times. He went on to become an internationally known “honey bee guru,” with the “pulse of the bee industry” and as “the go-to person” for consumers, scientists, researchers, students, and the news media.

A native of Schenectady, N.Y., Mussen credits his grandfather with sparking his interest in insects. His grandfather, a self-taught naturalist, would take his young grandson to the woods to point out flora and fauna.

Mussen received his bachelor’s degree in entomology from the University of Massachusetts (after turning down an offer to play football at Harvard) and then received his master’s degree and doctorate in entomology from the University of Minnesota in 1969 and 1975, respectively. His doctoral research focused on the epidemiology of a viral disease of larval honey bees, sacbrood virus.

During his academic career, Mussen conducted a varied program focused mainly on his role as liaison between the academic world of apiculture and real world beekeeping and crop pollination. Mussen tackled many new challenges on honey bee health and pollination concerns, including mites, diseases, pesticides, malnutrition, stress, Africanized honey bees and the successful pollination of California’s almond acreage.

He presented at national, state, and county beekeepers’ meetings, as well as at agricultural organizations. He educated the beekeeping industry and general public with his bimonthly newsletter, from the UC Apiaries, which he launched in 1976. He also wrote Bee Briefs, addressing such issues as diseases, pesticides and swarms. Both publications are on the departmental website at http://ucanr.org/sites/entomology/Faculty/Eric_C_Mussen/Apiculture_Newsletter/.

Mussen devoted his research and extension activities toward the improvement of honey bee health and honey bee colony management practices, helping growers, consumers, UC Farm Advisors, agricultural commissioners, scientists, beekeepers, researchers, pesticide regulators, 4-H’ers, and state and national agricultural and apicultural organizations, among others.

“I am basically all pro-bee,” Mussen told the American Bee Journal in a two-part feature story published in the September of 2011. “Whatever I can do for bees, I do it...It doesn’t matter whether there is one hive in the backyard or 15,000 colonies. Bees are bees and the bees’ needs are the bees’ needs.”

Considered by his peers as one of the most respected and influential professional apiculturists in the nation, Mussen received the prestigious American Association of Professional Apiculturists Award for Apicultural Excellence, California Beekeeper of the Year, Distinguished Achievement Award in Extension from the Pacific Branch of the Entomological Society of America (PBESA); a team award hailing “the bee team” from PBESA;



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and the statewide Pedro Illic Outstanding Agricultural Educator Award. Shortly before he retired, Mussen won the 2013 Alexander Hodson Graduate Alumni Award from his alma mater, the University of Minnesota, and the 2013-14 Distinguished Service Award for Outstanding Extension from the UC Agriculture and Natural Resources (UC ANR).

His nominators for the UC ANR award wrote that what sets Mussen apart from his Extension-specialist peers are these seven attributes:

1. His amazing knowledge of bees
2. His excellent communication skills in a diverse clientele, including researchers, Extension personnel, legislators, commodity boards, grower organizations, pesticide regulators, students, news media, and beekeeping associations at the national, state and local levels,
3. His eagerness to help everyone, no matter the age or stature or expertise, from an inquiring 4-H'er to a beginning beekeeper to a commercial beekeeper
4. His ability to translate complicated research in lay terms; he's described as "absolutely the best"
5. His willingness — his "just-say-yes" personality—to go above and beyond his job description by presenting multiple talks to every beekeeping association in California, whether it be a weekday, evening or weekend, and his willingness to speak at a wide variety of events, including pollinator workshops, animal biology classes, UC activities, fairs and festivals
6. His reputation as a well-respected, well-liked, honest, and unflappable person with a delightful sense of humor; and
7. His valuable research, which includes papers on antibiotics to control American foulbrood; fungicide toxicity in the almond orchards; the effect of light brown apple moth mating pheromone on honey bees; the effects of high fructose corn syrup and probiotics on bee colonies; and the invasion and behavior of Africanized bees. He is often consulted on colony collapse disorder and bee nutrition.

"Without question, Eric is the No. 1 Extension person dealing with honey bees in the nation, if not the world," said MacArthur Genus Awardee Professor Marla Spivak, Distinguished McKnight University Professor Apiculture/Social Insects at the University of Minnesota. "Research colleagues, beekeepers and the public are all very lucky to have him."

Said Extension Specialist John Skinner of the University of Tennessee: "Eric is one of the most well-respected and influential professional apiculturists in the nation. If I could select one person to represent the apicultural scientific community including research, regulation and extension, I would choose Eric."

"Those of us in the bee industry who have been privileged to know and work with Eric appreciate his vast knowledge of honey bees and great communication skills," said Gene Brandt, legislative chairman of the California State Beekeepers' Association. "Whether addressing scientists, beekeepers, growers, government officials, the media or anyone else, Eric can be relied upon to convey scientifically accurate information about honey bees and the beekeeping industry."

Said native pollinator specialist Robbin Thorp, emeritus professor of entomology at UC Davis: "He has played an invaluable role as a linchpin between honey bee researchers and the beekeeping industry and the commodity groups which depend on honey bees for pollination of their crops. His knowledge of honey bees and their biology, management and colony health is highly valued by his colleagues and clients. Eric is not only our state expert on all topics relating to honey bees, but is sought



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after by national organizations to participate on committees dealing with the most important concerns of the industry."

Extension specialist Larry Godfrey of the UC Davis Department of Entomology, who nominated Mussen for the Pedro Ilic award, praised him as "a worldwide authority on honey bees, but no problem is too small and no question too involved for him to answer. "He devotes his research and extension activities to the improvement of honey bee health and honey bee colony management practices. Eric helps growers, consumers, UC Farm Advisors, agricultural commissioners, scientists, beekeepers, researchers, pesticide regulators, 4-H'ers, and state and national agricultural and apicultural organizations. He ignites their interest in maintaining the health of bees, cultivates their friendship, and generously gives of his time and intellect."

"With the decline of the honey bee population and the increase of the mysterious colony collapse disorder, his expertise is now more highly sought than ever," Godfrey pointed out. "Any threat to honey bees is a threat to agriculture and a cause for his concern and a desire to assist. He is the only Extension Apiculturist in the UC system and in many regards, functions as the Extension entomologist for apiculture in the western U.S. and indeed, much of the country."

Mussen co-founded and served as president of the American Association of Professional Apiculturists. He delivered keynote addresses to the California State Beekeepers' Association (CSBA) and to the American Honey Producers' Association. He also served in leadership roles in CSBA, the California Bee Breeders' Association, California Farm Bureau Federation, American Honey Producers' Association, National Honey Board, American Beekeeping Federation, and the Northern California Entomology Society, among others.

His other activities included: serving as the UC Davis representative to the California State Apiary Board; offering input to the Department of Pesticide Regulation, particularly with the pesticide registration group; working closely with Cooperation Extension, California Department of Food and Agriculture, California Department of Pesticide Regulation, the California Farm Bureau Federation, researchers in the UC system, researchers at the USDA/ARS honey bee laboratories at Beltsville, Md; Baton Rouge, La.; Tucson, Ariz., Weslaco, Texas, and the U.S. Environmental Protection Agencies.

He also reviewed annual research proposals to the California State Beekeepers' Association, the Almond Board of California, and the National Honey Board, as well as Small Business Innovation Research applications at the federal level.

Highly sought by the news media for his expertise on bees, Mussen has appeared on the Lehrer Hour, BBC, Good Morning America, and quoted in the New York Times, National Public Radio, Boston Globe, and Los Angeles Times.

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Honey Bee Nutrition (Part 1 of a proposed series)

Dale Hill PhD, PAS, Quincy, IL

As a semi-retired professional animal nutritionist, and having worked with a large variety of animal species, my approach to honey bee nutrition is likely somewhat different from those trained in entomology. I have had the opportunity over many years to work with a wide variety of ingredients, many of which are best suited for specific needs for a variety of species. The biggest challenges for honey bee nutrition are the need for more and better information regarding what nutrients the honey bees need, and be able to manufacture a blend of ingredients that can be reduced to pollen-size that the bees will readily consume, digest and utilize for optimal body functions. Many ingredients may provide appropriate nutrients, but usually not the amounts needed, so it takes a variety of ingredients to provide all of the nutrients in the correct amounts that honey bees need.

Honey bees, like all other animals, require water, protein, fats, carbohydrates, vitamins and minerals.

Water should come from a clean source. Bees seem to like swimming pools, ponds and sometimes "non-hygienic" water sources. I have to wonder if some of this may be related to the taste of the water. It would be like comparing bottled water to water that you have added a flavoring to. Which do you prefer to drink?

Proteins must come primarily from pollens that must be broken down to amino acids, the building blocks of protein, by the bee's digestive enzymes. Once the proteins are broken down to amino acids, the bee (and all other species) will re-assemble these amino acids into specific proteins and enzymes needed for all body functions. Pollens from various floral sources will vary from 4% protein to 60% protein, while the summer protein needs of the honey bee are in the range of 18-22%. This is why bees need to harvest pollens from a variety of plant sources.

Fats (more correctly called lipids) come from pollens, and to a lesser extent nectars, that must be broken down to fatty acids, the building blocks of lipids/fats. While some short-chain fatty acids may be used for energy, the longer chain fatty acids are incorporated into the bee's cell walls to help maintain cellular structure and function. Very long-chain fatty acids may also be used by the bee to make pheromones and reproductive hormones.

Carbohydrates, which may come from a wide variety of sugars and starches, are used primarily for energy for flight and in-hive activity, and for making honey and bee bread. Some carbohydrates are also used to provide food for the bacteria that ferment the stored pollen and convert it into bee bread for later food use. Nectars are the primary source of simple sugars (glucose and fructose), and the sugar content will vary among the various plant species from 5% to 75%. Bees prefer those floral sources with the higher (sweetest tasting) sugar content. Bees have a limited ability to digest raw starches as commonly found in raw grains, but appear to be able to better digest cooked starches. Uncooked starches are more likely digested by the intestinal bacteria than by the honey bee itself, and too much raw starch in the diet will result in loose feces and diarrhea in many species.

While the roles of most vitamins and minerals have not been clearly demonstrated in scientific research, I believe that it is safe to assume that vitamins and minerals play the same basic biochemical role in bees as in other species. The one major exception to this is Vitamin D and its role in the skeleton in vertebrates. Vertebrates (those animals with a spinal column) utilize minerals, especially calcium, phosphorus and magnesium deposited into a protein matrix to form a hard

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internal skeleton. In these animals, Vitamin D plays a significant role in regulating the deposition of calcium into the skeletal matrix.

Insects, on the other hand, have a hard external skeleton rather than an internal skeleton. This is called an exoskeleton and is chitin-based. Chitin is a sugar-based compound, and is somewhat similar to cellulose, the supporting tissue of plants. Vitamin D does not have any known role in this process, but Vitamin D is sometimes found at very low levels in some pollens. Based on new research techniques and much more sensitive laboratory equipment, it would be reasonable to assume that there may be other biological roles for Vitamin D in honey bees that have not yet been discovered. The same comments would also apply to Vitamin A and Vitamin K.

It is highly likely that Vitamin E has the same biochemical functions in honey bees as in other species, and that is as a cellular antioxidant. Fatty acids were mentioned above, and the primary role of Vitamin E is to help reduce the rate that these long chain fatty acids oxidize (go rancid). It is the oxidation of fatty acids in cell walls that is a primary determining factor in the aging process (in all species). In this role as a cellular antioxidant, Vitamin E also plays a role in immunity (ability to resist diseases).

Recent advancements in lab equipment should allow for a better determination of Vitamin E requirement(s) for honey bees. If Vitamin E added to bee protein supplements could help slow down the aging process of foraging bees, even by a few days, it could potentially provide an increase in hive populations. What has not been clearly demonstrated is if honey bees can metabolize the more stable chemical form commonly used in livestock feeds, or whether they might need the less stable (and much higher cost) version found in plants in the form of mixed tocopherols. Of further interest regarding Vitamin E is one of the primary biological roles of Vitamin C (ascorbic acid) to regenerate Vitamin E for extending the effectiveness of its antioxidant role.

It is reasonable to assume that the B Vitamins (thiamine, riboflavin, niacin, pantothenic acid, folic acid, biotin, Vitamin B-12, choline) have similar biochemical functions in honey bees as they do in other species. There has been a limited number of scientific publications on specific B vitamins to support this. The bigger question is how much of each B vitamin is needed to support the honey bee's full life functions, especially the reproductive role of the queen.

The major minerals (calcium, phosphorus, magnesium) are needed in lower quantities in honey bees than in vertebrates due to the basic difference in the skeletal system. Other major minerals (sodium, potassium, chloride) are also likely needed in lower quantities. This is the reason that livestock mineral mixes are not suitable for honey bees.

The trace minerals (copper, iron, iodine, manganese, selenium and zinc) are also likely needed in lower amounts than utilized by livestock, mainly due to differences in body size. As with the vitamins, the minerals would be used for similar basic biochemical functions as vertebrates (those functions other than skeletal calcium and magnesium). Phosphorus is needed by all energy metabolism functions for all species. Zinc is needed for a large number of metabolic functions in all species for digestion and reproduction.

The vast majority of published scientific articles attempt to base the nutritional needs of honey bees on the nutrient levels in the pollens that are brought back to the hive. This is likely based on the incorrect premise of "you are what you eat". This is not a good scientific approach since much of the pollen material is not digestible and is passed out in the feces. It is more correct to say "you are what you don't excrete", but this approach still does not provide good evidence of nutrient needs. My approach is to base the needs of the honey bee on body composition, and then attempt to match as closely as possible to those nutrient levels. This approach is not without faults, but is likely the better method for determining nutrient needs. With the difference in life span of summer bees versus winter bees, there are likely some seasonal differences in the nutrient needs of bees.



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A Canadian beekeeping perspective on colony health and growing our local queen supply

By Dr. Miriam Bixby, Bee 'Omics research project, University of British Columbia, Vancouver

The Bee 'Omics queen research project was launched in October, 2015 funded by Genome Canada among others and led by Dr. Leonard Foster at the University of British Columbia and Dr. Amro Zayed at York University. One of the objectives of the project is to solicit information from Canadian beekeepers about their operations, and specifically their queen buying and breeding strategies, in an effort to better understand the honey bee queen industry in Canada. Ultimately, the project would like to use this knowledge to play a role in further developing queen breeding in Canada with a focus on supplying strong local queens bred to meet the needs of Canadian beekeepers.

During the winter, spring and fall of 2015-2016, the Bee 'Omics team recruited beekeepers to complete a queen industry survey and simultaneously facilitated queen breeding focus groups in B.C, Alberta, Saskatchewan, Manitoba and Ontario as part of the provincial beekeeper association meetings. Over 150 Canadian beekeepers (1.8% of all beekeepers in Canada in 2015) managing 106,592 colonies (14.8% of all Canadian colonies in 2015) completed this survey with the vast majority also participating in the focus group discussions.

Beekeepers were asked in the survey to report what they believe to be the causes of their colony losses over the past winter as well as their opinion on the biggest risks to beekeeping in Canada. Queen issues, starvation and Varroa were the top three reasons for colony loss, according to beekeepers, representing 62% of all responses (Figure 1).

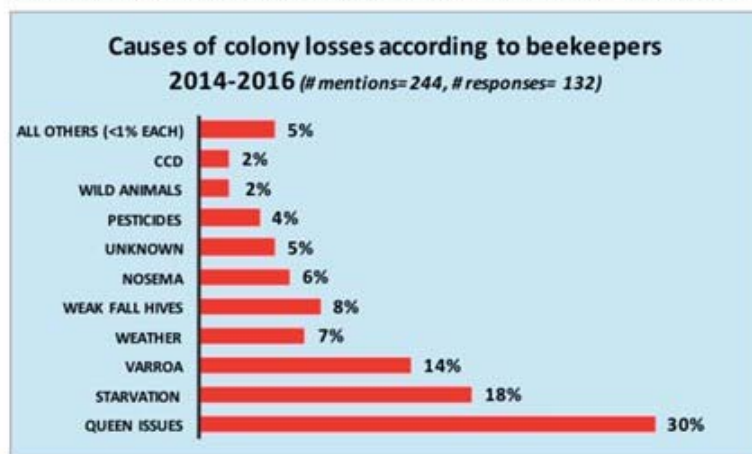


Figure 1. What beekeepers believed were the causes of their own colony losses over the winters of 2014- 2015 and 2015-2016 (beekeepers could choose multiple causes).

Whereas the top risks to Canadian beekeeping were pesticides (17%), Varroa (15%), and importing issues (14%) (Figure 2). The focus group sessions began with beekeepers discussing these risks and how best to address them in the future. Aside from pesticide use, beekeepers expressed optimism that with a multi-pronged approach of limiting bee imports (and associated pest and pathogen imports) while strengthening our domestic queen and beekeeping industries, we could mitigate some of these risks.

It became clear in the discussions that a majority of beekeepers preferred to buy local queens or breed their own and yet there was a frustration with the mindset that queen imports are a "necessary evil" and that local queens are not easily available at bee co-ops. The survey showed that less than half of the queens obtained by the respondents were local (Figure 3) and yet the beekeepers emphasized as a group that in their experience imported queens and packages often result in a net loss for the beekeeper. It is important to note that only 15% of the survey respondents imported queens from Hawaii, however, as a whole, Canadian beekeepers import closer to 80% of their queens from Hawaii. Beekeepers suggested that imported bees are of a poorer quality overall compared to local bees, requiring additional care, feeding, treatment and often are less productive and do not survive the season, requiring colony replacement.

To address the issue of poor imports, the discussion among beekeepers focused on expanding the local breeding sector and how to make Canadian queens available early enough in the spring. Several beekeepers argued that by shifting our current paradigm and embracing the possibility of banking queens over the winter or supplying stronger queens later in

Biggest risks to sustainable beekeeping in Canada

(# of mentions= 246, # responses= 123)

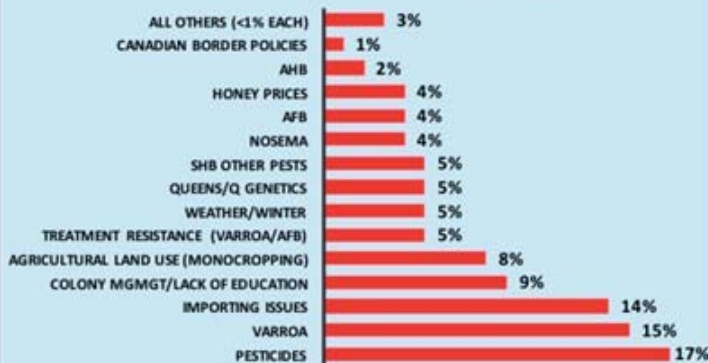


Figure 2. What beekeepers believe are the biggest risks to productive and sustainable beekeeping in Canada (beekeepers could choose multiple risks).

the spring, we could meet a large percentage of our national queen demands each year.

The survey results show this strong desire for local queens (Figure 4) as well as the reality that the majority of beekeepers surveyed (75%) do not need their queens until May and June (Figure 5), a time frame that many beekeepers believed could be achieved by most Canadian breeders.

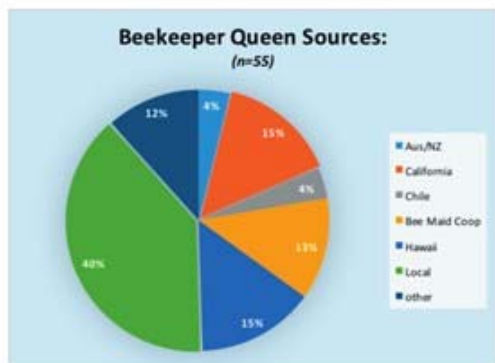


Figure 3. The distribution of queen sources for beekeepers who indicated that they purchased their queens.

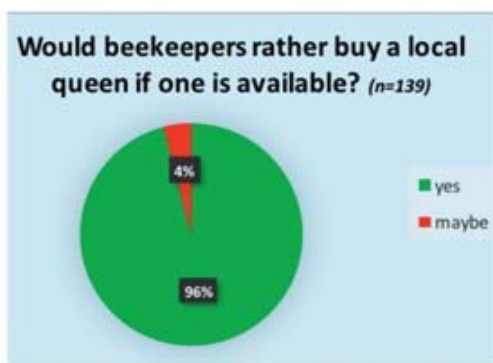


Figure 4. Canadian beekeepers' preferences for purchasing queens.

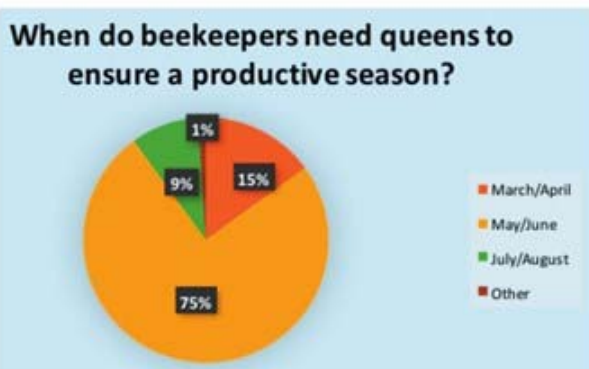


Figure 5. Desired timing to receive queens for Canadian beekeepers.

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The top seven bee traits sought after by surveyed beekeepers were honey production, gentleness, overwintering ability, hygienic behavior, mite resistance, brood pattern and bees being disease free, collectively representing 69% of all responses (Figure 6). These traits are all key variables being studied in the Bee'Omics project with the objective of providing multi-trait analysis of bees (encompassing these traits among others) to beekeepers during the life of the project. 89% of beekeepers expressed a strong or moderate interest in sending samples of their bees to an independent lab for trait analysis using a new Marker Assisted Selection (MAS) tool currently being developed at UBC by Dr. Foster's lab and at the National Bee Diagnostic Center (NBDC) (Figure 7).

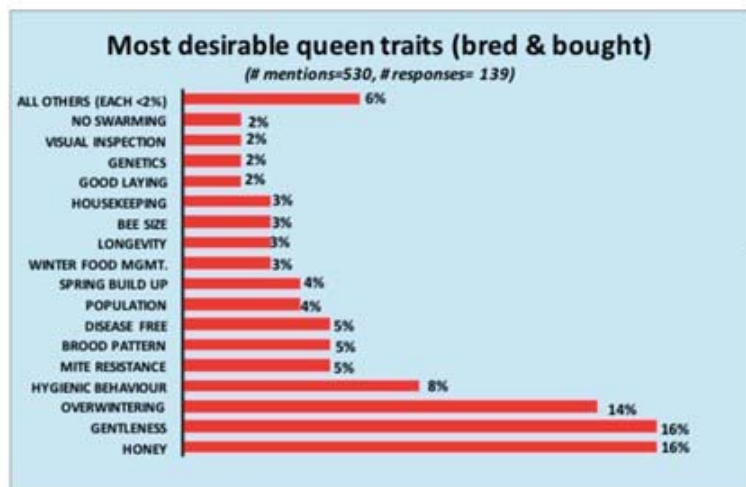


Figure 6. Beekeepers' preferences for traits in their bred or bought queens.

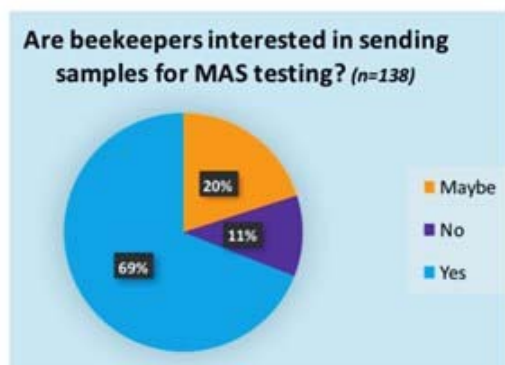


Figure 7. Beekeeper interest in sending bee samples to a lab or trait analysis.



Figure 8. Beekeepers' valuation of purchased queens, their own bred queens, and their willingness to pay for a queen with their top two most desired traits (bred or bought).

There was a concern raised by beekeepers that local queens are undervalued, making local breeding operations not financially viable. The survey responses indicate that queens selected for a beekeeper's top two traits are very highly valued (Figure 8). This would suggest that Canadian breeding operations that engage in accurate and consistent selective breeding (potentially through MAS), would be in a position to succeed economically.

Beekeepers also expressed an interest in a third party assurance of the bee traits in the form of government certification (Figure 9) or as discussed in the focus groups, an independent third party such as the NBDC lab with mandatory re-testing every year to provide some risk mitigation to the buyer.

Are you willing to pay more for a government-certified queen? (n=122)



Figure 9. Beekeeper desire for government confirmation of a queen's traits

Would increasing domestic queen supply strengthen beekeeping in Canada? (n=136)



Figure 10. Beekeepers' beliefs about increasing domestic queen supply in Canada.

The focus group participants suggested that a tech transfer team or other industry support framework be established during the initial stages of the trait sampling and testing in order to effectively bring this beekeeping tool into beekeeping communities across Canada. Beekeepers were keen to receive the results of trait testing to either implement the findings in their own breeding operations or to more accurately predict the performance of local breeders' queens.

The focus groups and survey wrapped up with a final question about the value of further developing our domestic queen supply industry in Canada. 93% of all respondents indicated that increasing domestic queen supply would strengthen beekeeping overall in Canada (Figure 10). There is a strong desire among beekeepers surveyed and in discussions to address the key issues facing honey bees in Canada by adopting more effective breeding strategies and tools and supporting local bee breeders. Bee'Omics research aims to bring scientific selection tools to Canadian beekeepers with the overall objective of increasing local breeding, strengthening Canadian honey bee colonies and ultimately making our agricultural industries more autonomous and sustainable.

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What's the Buzz on the Weekend of Bees?

Thanks to Kristy Levings, CA Honey Festival Program Coordinator

Honey captures the essence of a place as few other foods can. Like wine, a batch of honey is influenced by the countless tiny contributions of soil, flora, micro-climate, and sunshine. But in this case, there is no master winemaker curating the blend. Instead, we rely on the humble honey bee to telegraph the terroir of a locale through the flavor of the honey.

On Saturday, May 6th, The California Honey Festival celebrates the tiny tastemakers and their beautiful amber product with a day-long food festival in Woodland, CA. Long a quiet 'honey-hub' of Northern California, millions of dollars of pollination services flow through Woodland each year. Celebrating the sweet product in a town crucial to the tasty trade is only natural and the day-long festival will take over Woodland's picturesque and historic downtown Main Street.

Just 10 minutes from Davis and a short hop from the San Francisco Bay Area and Sacramento metropolises, the California Honey Festival is co-hosted with the Honey and Pollination Center at the Robert Mondavi Institute at UC Davis.

Amina Harris of the UC Davis Honey and Pollination center describes the impact of this event: "The pollination services of honey bees is so important- one out of every three bites of food is because of bees. These creatures and their beekeepers deserve a dedicated festival!"

With five stages of live entertainment, the California Honey Festival presents a culinary stage with live cooking demonstrations, a dedicated Busy Bee Kids Zone with hands on activities, a beer garden, a Pollinator Park, and opportunities to taste honeys from all over the world.

What about humanity's oldest known alcohol made from Honey? Mead will be at the festival, but you'll have to find it hidden at the 'Mead Speakeasy' embedded in a secret location within the festival.

National speakers, chefs, artists, musicians and more will converge on the California Honey Festival to create a marvelous interactive festival experience.



- The Culinary Stage will feature nationally known cookbook author Marie Simmons, author of bestselling cookbook: 'Taste of Honey'.
 - The Busy Bee Kids Zone will offer hands-on kid's activities in partnership with the Planet Bee Foundation, a Marin County non-profit.
 - The Pollinator Park & Garden Stage will showcase the latest in pollinator and water-wise gardening from the Hagen- Dasz demonstration garden at UC Davis.
 - At the Honey Lab, festival-goers can take a dive into the hive and explore what it's like to be a bee. They can also taste their way around the world in honey samples.
- For the beginning beekeeper, the dedicated Beekeeper Stage features National Honey Board CEO Margaret Lombard.
- The Main Stage will play live music all day including a lively set by Joe Craven and the Sometimers, brazilian based band Boca do Rio and the City of Trees Brass Band.

Crooners The Gold Souls and Jared Johnson can be found at the Mead Speakeasy... but you'll have to find it first and know the passcode to get in.

A wide variety of vendors offering honey specialties, delicious food, arts, crafts and more await festival goers. The free family friendly festival is the 'place to bee' on Saturday May 6th. Open from 10am-5pm.

For the dedicated bee lover, they can easily turn it into a full 'Weekend of Bees' starting with the festival Opening Night Reception on Friday, May 5th. Entitled the 'V.I.Bee', this event is the pre-show party the night before welcoming speakers, sponsors, and supporters of the California Honey Festival. Art Car Apis Inlusio will be making an appearance at the V.I.Bee reception before rocking out at the Festival the next day. Tickets available to the V.I.Bee at: VibeeCalifornia-HoneyFestival.eventbrite.com

After the festival on Saturday, the Honey and Pollination Center at the Robert Mondavi Institute at UC Davis will be offering a 'Bee Symposium' for the avid beekeeper on Sunday May 7th. This research driven event shares the latest findings on their theme: "Keeping Bees Healthy". Visit their website for more information: honey.ucdavis.edu/events/2017-bee-symposium

From Friday evening May 5th to Sunday May 7th, the 'Weekend of Bees' promises to be a sweet time with something for everyone. The California Honey Festival on Saturday May 6th is a singular achievement honoring the hardest working member of our food system: the honey bee. With honey as the inspiration, how could it be anything but a sweet time.



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MAY 6th

SATURDAY
10AM to 5PM

www.californiahoneyfestival.com



FREE EVENT!

5 Stages of Live Entertainment

Busy Bee Kids Zone

Giant Bee Art Car "Apis Inlusio"

Hands-On "Honey Lab" tasting experience

Secret 'Mead Speakeasy' hidden in the festival!

REGIONAL NEWS

British Columbia

Ian Farber, Director

The spring report has much to do with the weather over the past winter. BC had what some have called an 'old time winter'. Throughout BC, there were prolonged periods of cold and lots of snowfall. Snow remained on the ground at the coast for weeks. Even in areas that usually get rain in the winter, this year it was snow. Right now, at the beginning of April, the estimate of being 2-3 weeks behind last year is a common thought. Will the dandelions ever bloom?

Some beekeepers are reporting higher than usual consumption of honey stores within hives. Pollen gathering by honey bees started much later than normal. Winter losses may be higher this year. The provincial winter loss (survival) report will be conducted this May.

The BC Honey Producers' Association's (BCHPA) Certified Instructors' Program certifies new instructors to teach introductory beekeeping courses. To become certified, a candidate must have a solid background in beekeeping, a bee master's certificate, and some teaching/instruction experience. Once certified, an instructor then conducts an introductory beekeeping course with a minimum 16-hour curriculum plus practical hands-on field days. This ensures that novice beekeepers are introduced to reliable, proven beekeeping theory and practise. A minimum set curriculum is taught, augmented by the knowledge and expertise of the individual instructor. One benefit of this program is that certified instructors can provide courses in less populated areas of the province.

Various clubs and the BCHPA have hosted national and international speakers for spring presentations with great enthusiasm and attendance from beekeepers of all levels of experience. As one example, Michael Palmer spoke in Kamloops to an enthusiastic and sold out audience on the theme of sustainable beekeeping. Beekeeper presentations at garden centers, community centers, school classrooms and for the Day of the Honey Bee are well attended and very popular with the general public. Beekeeping is enjoying a resurgence as more and more cities welcome backyard beekeeping. The public is seeking a locally produced, high quality honey. Club membership numbers are surging upward. Clubs offer much in the way of beekeeper professional development and field days. Hopefully, this will attract the group of people who want to start beekeeping by "just having a hive in the backyard." With the large number of courses available to the novice beekeeper there is great hope that informed newcomers will continue the fine tradition of being good beekeepers as stewards of our bees and our industry.



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Canadian Honey Council - On the record

Rod Scarlett, Executive Director, CHC

Looking back on 2016, the year started with some very good overwintering numbers in almost all regions of Canada, offset by a dramatic drop in honey prices. Over the year, honey prices have rebounded a little, but nowhere near the prices witnessed two years ago. While a number of factors influenced the price drop, the CHC has focused on adulterated and transhipped honey, drawing the issues to the public's attention and questioning the Canadian Food Inspection Agency (CFIA) on the extent of their testing and investigative work on the country of origin. Much more work needs to be done.

For the past four years the CHC has been working with the Canadian Agricultural Human Resource Council (CAHRC), on the temporary foreign worker's four-in-four-out rule (which forces workers who have been in Canada four years to wait another four before they can apply to re-enter the country). CAHRC's "Apiculture Industry Labour Market Forecast" says: "Beekeepers face major labour shortages that affect the industry's production capacity and growth potential. Labour shortages were a significant factor for beekeepers in 2014 with nearly two-thirds of operations (63%) reporting that they were not able to find all the workers they needed. This is much higher than the (ag) sector average of 41%.

Beekeepers were also much more likely to report delaying or cancelling expansion plans as a direct result of not having enough workers. Labour shortages are estimated to have cost the industry \$7 million in 2014, or 4% of sales, which is higher than the sector average of 2.7% in lost sales." In early December the Government of Canada announced that the four-year cumulative duration rule will no longer apply to temporary foreign workers in Canada, effective immediately.

Honey labelling continues to be a concern with both CFIA and Health Canada now proposing labelling changes. The job ahead for the CHC, in cooperation with each provincial association, is to ensure that new labelling requirements do not in any way hinder the sales and reputation of Canadian honey. Honey promotion remains a key initiative of the CHC. This past year, three directors were involved in the SIAL Paris trade show and came back with positive reports.

In the spring of 2016, Health Canada announced a new antimicrobial policy that could have major ramifications on beekeepers access to tylosin and oxytetracycline. Presentations were made to the Canadian Veterinary Medical Association and the CHC continues to push for an equitable solution for beekeepers while recognizing regulatory requirements.

The Canadian Bee Health Roundtable was active and published the "Canadian Best Management Practices for Honey Bee Health". The manual's content ranges from "regulations for pest and disease treatment thresholds to management of colonies during pollination services." Copies can be downloaded from the CHC website and limited hard copies are available on request. Also being published are two documents related to forage and nutrition. "Planting Forage for Honey Bees in Canada" provides an overview of where and how honey bee forage can be created in Canada. "Honey Bee Forage and Bee Habitat: Programs, Management Practices, and Gaps in Canada" outlines current available programs. Again, these can be downloaded from the CHC website.

Late this past fall the CHC launched its CHC app which can be downloaded for free at the app store and accessed by typing in 'honeycouncil'. There are still some kinks, but the app will allow up to the minute updates, access to survey information and connect users with key biosecurity and food safety information. With regards to food safety and biosecurity, the CHC continues to push beekeepers to adopt practices that enhance these practices. Information will soon be available that outlines how these practices can open up market opportunities in Asia.

The work your Board does for industry often goes unnoticed and under-appreciated. Many thanks to current and retiring board members for your support and guidance. May 2017 bring all of us a prosperous and successful bee season.



Fred J. Rathje Award 2017 to Heather Higo

When the North American Beekeeping and Research Conferences were held in January this year, they encompassed American and Canadian organizations in a major North American symposium.

British Columbians were delighted to see one of their own, Heather Higo, receive the Fred J. Rathje Award from Canadian Honey Council for long service to the advancement of beekeeping and bee research. Higo worked with Dr. Mark Winston at Simon Fraser University in Burnaby, BC, for more than 20 years and is now a key component of Dr. Leonard Foster's lab at the University of British Columbia. Many of North America's top honey bee research people went through Winston's lab, and Higo was there all the way. Congratulations, Heather!

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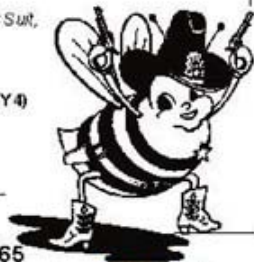
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