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### Subscription Options

The new year is a good time to look at your address label to determine the status of your subscription. If there is a two digit date on the label of 98, 99, 00 or some other year in the future, you are in business. If the year is 97 or less, you are now behind.

You have two options, now, if you wish to keep reading the newsletter. You can return the slip, cut from the last page, with your payment for future years or you can pick up the newsletter from the Web.

To see yours truly and his newsletter issues (goes back a ways) use this URL <http://entomology.ucdavis.edu/faculty/mussen/news.html>. Actually, you have to stop at "faculty" if you want to see the picture they use of me.

Whatever you choose to do about your subscription, please don't delay. I'm going to have to cut off the mailed subscribers who are

in arrears very soon. I hope that you still think that you get \$7.50's worth of info from the newsletter each year.

### Outside the Box

Whether you enthusiastically participated or reluctantly endured the special one-day seminar conducted by the National Honey Board at the CSBA Convention, you had to admit that it was "different." The seminar facilitator, Edward D. Barlow was something else. If you have listened to me compress two hours worth of information into 45 minutes, you can imagine what it is like to get a motivational speaker and other speakers who compressed a three-day program into a few hours.

What was the message of "Think Outside the Box: Creating Business and Marketing Strategies for the 21st Century"? Simply, be in the lead or get left behind. The program did not direct attention toward any particular aspect of beekeeping, but the message was: Don't get stuck in a rut!

Just this sort of "Outside the Box" thinking has led to a very different view of beekeeping for a company from Mesa, Arizona, called Apis Inc. Darryl and John, the owners of the operation, did not come from a beekeeping background, as you will see. They approached pollination as entrepreneurs, not as beekeepers. They collected as much information as they could find from reading books and surfing the World Wide Web. They thought that large boxes, housing lots of colonies was the way to go. What size box? A size that could just be assembled from conventional 8x4 foot sheets of plywood, particle board, and various insulations and plastics. With proper alignment, you can get eight 14-frame (2 stories of 7 frames) colonies in a box. The box has heavy insulation in the cover and insulated walls. Each "hive" has Pierco plastic frames. By eliminating the wood in the frames, the owners feel they have the equivalent of 8-frame equipment. Each "hive" is closed with a plywood cover. Ventilation is through a single, good sized, screened hole in the bottom of each unit. Large entrances of plastic pipe allow bees to fly out the sides of the box. Caps with various screen meshes are placed on the pipes as entrance reducers or closures.

Honey production is a problem in this operation, since the system is geared specifically for polli-nation. Each colony must be func-tioning optionally to make the system work. That requires frequent visits to the bees. A master bee-keeper uses a hand-held data logger to record the box number and con-dition of each colony. Two other persons do the looking and de-scribing, each

looking at four colonies. If the inspections cannot be completed in an average of 3 minutes per hive, the team is "retrained." The owners download all the information into a central computer and plan future work visits to the apiary depending upon what was found.

Does this work? The plan a year ago was to start with 1,200 colonies and split up to 3,600. They were told that was impossible. Instead they split up to 4,800; made a profit at \$40 a colony for almond pollination; and are on their way to a very successful future, they think.

Also, in the future, are plans to put a 286 computer chip in each box. Sensors in each "hive" will record temperature, queen pheromone level, and perhaps wing beat sound. When something becomes irregular, central control will be notified. Each box will be equipped with GPS sensors so that it "knows" where it is, and satellite phone links will let it communicate with the home computer. It will even tell you when it is being stolen and where it is being taken.

I'm sure that this sounds a bit hard to swallow, but I have invited the owners to bring a unit to the next CSBA convention, to be held in San Luis Obispo next fall. The boxes are hauled on a 45 foot trailer and they load 576 colonies, with the boxes stacked triple. At \$40 a colony, that would be a terrible load to turn over!

No, this is not typical bee-keeping. But, it is possible that it is the future of pollination. It may very well be worth "Looking Outside the Box" in your operation.

CA Pollination Prices

For a number of years Kevin Roberts has solicited information from California beekeepers about the prices that they receive for pollinating various crops. One of the hopes of this undertaking was that beekeepers could see the average value of their services and not place colonies for prices below the average rate.

I have excerpted some of Kevin's data from the 1997 survey on major crops pollination in California.

Crop	High Fee	Low Fee	Average
		(\$)	(\$)
Almonds	45	30	38.52
Plums	40	34	39.06
Prunes	15	4	9.68
Cherries	40	10	17.56
Apples	20	8	12.79
Melons	55	12	18.66
Alfalfa seed	35	20	25.75

Obviously, prices vary. The highest rental price in melons sounds like a price from Washington State. The lowest price for prunes certainly did not pay for the move. It is those aberrantly low prices that undermine the value of pollination industry wide. If you are going to rent bees for pollination, rent strong healthy colonies, be proud of your product and service, and charge a fee that reflects the value of your product and the need to make a profit.

### Mating Success

Renewed concerns about queen retention sparked a panel discussion at the CSBA Annual Convention held in Ventura. One of the causes for queen failure, mentioned at the meeting, was inadequate

mating. With the demise of most of our feral honey bee colonies, are there still enough drones around to adequately meet the needs of our queens?

One of the panel members, queen breeder Tom Glenn of Glenn Apiaries, described a method that can be used to determine, within reason, how well a queen has mated. The method depends upon an examination of the sperm-holding organ of the queen (spermatheca), so it is a "destructive sample" as we call it in the profession.

The steps in Tom's methods include:

- "A.** Kill the queen by pinching her head.
- B.** Grasp the last abdominal segment (where the stinger is) with either your fingers or forceps and pull this segment away from the rest of the queen. Make sure you grab just the last segment, and don't worry about being stung.
- C.** Discard the queen's body.
- D.** The spermatheca is buried in the mess, but is remarkably sturdy and can be squeezed out by rolling your fingers together, or between the backs of your thumbnails.
- E.** The spermatheca rolls out as a perfectly round sphere about 1 mm in diameter. It appears white because it is covered with a tracheal net to provide oxygen to the sperm. The covering is removed by rolling it for a few seconds between your fingers. Now it is ready to analyze.
  - 1)** If the spermatheca is perfectly clear, the queen has not been mated. She was a virgin queen.
  - 2)** If it is tan and opaque, there was plenty of sperm to fertilize eggs. This was a well mated queen.
  - 3)** If it is milky and translucent, the supply of sperm was running low, either from age or inadequate mating.

It may take a couple examples to distinguish the tan/opaque condition from the milky/translucent appearance."

### Stimulative Feeding

Many beekeepers feed sugar syrup to honey bee colonies to stimulate greater brood production. In Vol. 78, No. 2, pp. 56-62, of Bee World, Mark Goodwin reviews sugar syrup feeding and how it affects pollen collection, among other things. In 1961 it was demonstrated that colonies fed sugar syrup gathered substantially more pollen. Experiments in orchard settings showed increases in both target and non-target pollen collection, and the results were not predictable.

Increase in pollen collection was assumed to be due to an increase in brood production following sugar syrup feeding. However, sugar syrup feeding induces extra pollen collection even when brood rearing doesn't change. If feeding is discontinued, pollen collection often decreases, even though brood rearing hasn't changed. Dr. Free from England collected evidence that the extra syrup "converted" nectar collectors to pollen collectors, since total foraging didn't change during his studies. If nectar accepting bees in the hive are filled with sugar syrup, then nectar collecting is slowed down badly at the unloading end of the trip. Even kiwi pollen collection picked up significantly when bees were fed syrup in New Zealand. If your grower complains about feeding sugar syrup to your colonies, share this information with him or her.

### Essential Oils and Mites

Despite the fact that no new compounds have been registered for controlling tracheal or Varroa mites does not mean that no one is working on the problem. A recent issue of the Journal of Economic Entomology had back-to-back articles on mite control by Drs. Nicholas Calderone, Bill Wilson and Marla Spivak (Vol. 90, No. 5, 1997, pp. 1080-1086) and by Dr. Marion Ellis and Frederick Baxendale (Vol. 90, No. 5, 1997, pp. 1087-1096).

Calderone et al. discussed results of studies in which they mixed thymol with cineole, citronella, and linalool and tested two amounts of the fumigants in hives versus control colonies. Thymol and cineole knocked down more Varroa (49.1-56.4%) compared to the controls (28%). In fall applications in tracheal mite infested colonies, mite levels increased 28.3% in control colonies by the next May, whereas mite levels in treated colonies decreased by 22.4% in the colonies with the citronella mix.

They concluded that the tested essential oils might be of value in tracheal mite control but that they would not be of much value against Varroa mites when brood is present in the hives.

Ellis and Baxendale conducted laboratory assays of 7 monoterpenoids against tracheal mites. Thymol and menthol were most toxic to the mites. These two, plus citral and carvacol, were more toxic to tracheal mites than honey bees. The other two, pulegone and d-limonene, were more toxic to the bees than to the mites. Menthol was 18.9 times more toxic to mites than bees at lower doses, but only 5.7 times more toxic at higher doses (bees started dying). Citral and thymol

were between 3.6 times more toxic to mites than bees at all concentrations.

These results continue to emphasize that honey bee mites tend to be more chemically sensitive than honey bees. But, a lot of study is required to determine how much of a compound should be used, and how it should be formulated, to kill mites and not bees. The second important concern is to be certain that hive products, especially honey, are not contaminated. All this research requires a great deal of time to be conducted well.

#### Moth Control-Revisited

Years ago (1980) Dr. Ross Nielsen conducted experiments in controlling greater wax moth by releasing irradiated male moths into the environment. The male moths were not necessarily sterile, but their genetic material had been damaged by the irradiation. Later, Dr. Nielsen and local beekeepers claimed that the local wax moth problem had been reduced dramatically. These results were not accepted widely, and wax moth pupa irradiation never became a control practice.

Recently, two researchers in Damascus, Syria, conducted similar studies on potato tuber moths under controlled conditions. Adult male moths were subjected to sub-sterilizing doses of gamma irradiation. The irradiated moths mated normally, as did their F<sub>1</sub> male offspring. However, all F<sub>1</sub> progeny developed more slowly, with abnormally high mortality. Longevity, numbers of eggs laid and numbers of eggs surviving were lower in the F<sub>1</sub> progeny, and the sex ratio of offspring was skewed toward males. Obviously, these genes

would continue to be passed along. The authors concluded that substerile irradiation of potato tuber moths could contribute to a control program. Perhaps we gave up on the Nielsen work prematurely! (Makee and Saour, 1997, J. Econ. Ent., October, pp. 1097-1101.)

#### Vietnamese Mite Control

In the early 1960's Apis mellifera was introduced into Vietnam. Two parasitic mites of honey bees were already there: Varroa jacobsoni on Apis cerana and Tropilaelaps clareae on Apis dorsata. The mites quickly moved onto the new host and became a problem. The non-availability of chemicals to control the mites nor the money to pay for them forced the beekeepers to use other means to control the mites.

Fortunately, T. clareae needs to be on the brood almost constantly. Therefore, by caging the queen or otherwise inducing a brood free period T. clareae can be reduced, temporarily to zero.

It is not quite so easy with Varroa. One useful procedure is to cut the lower corners off combs in the brood nest. The new comb is built back as drone comb. Drone brood attracts the mites and capped drone is cut off and discarded every 15 days. A second approach is to add a frame with no comb or foundation. A strong colony of bees is apt to draw a frame of drone comb under the correct environmental conditions. Although this comb would attract mites in the original hive, it is often transferred, when the larvae are four days old, to another colony that is heavily infested. The drone brood loads up with Varroa. The comb is removed, uncapped, the

larvae spun out in an extractor and eaten (by humans), then the comb put back to trap more Varroa.

In a more complex method one colony is made broodless by trans-ferring brood to a second colony. In that colony, the queen is re-placed with a queen cell. The introduced brood captures Varroa mites and is discarded. There is a break in brood rearing both in the colony with the new queen and with brood being taken out of the queen-right colony. T. clareae dies, Varroa is reduced to subeconomic levels, concurrently. There are even more complex manipulations between colonies that are explained. But, the reality is that "... professional beekeepers in Vietnam manage to control both T. clareae and V. jacobsoni without the use of chemicals."

### Mites Wanted

In my last newsletter, I mentioned the desire of USDA researchers in Tucson to obtain queens from "survivor stocks" of honey bees that survived Varroa. Now, USDA researchers in Baton Rouge want Varroa mites, themselves, for genetic studies. There is a theory that all Varroa are not the same. Researchers wish to study local Varroa populations to determine their origin. It takes at least 10 mites to run the analysis.

If you have colonies that you forgot to treat or have mites that made it through your treatments, please consider sending samples of the mites, or bees with mites on them, to: Dr. Lilia de Guzman, Research Entomologist, Honey Bee Breeding, Genetics and Physiology Laboratory, 1157 Ben Hur Road,

Baton Rouge, LA 70820. She would be very happy to receive the mites/ bees with mites in rubbing alcohol. Thank you for helping with this research request.

### Tolerance Levels

Have you ever wondered how much of a residue of a specific agricultural chemical can be on a product and still be "within tolerance?" Or, have you had similar questions about residues of the materials used around bee hives that might get into honey. Well, as Fox Mulder says, "the truth is out there." But, in this case the government actually provides the truth, as long as you have access to the World Wide Web.

After hours of hunting ("surfing") on the Web, Univ. of Nebraska Apiculturist, Dr. Marion Ellis, found a site with the info:  
<http://access.gpo.gov/nara/cfr/index.html>. A companion source for registration status is <http://www.epa.gov>.

In case all this Web stuff is not your cup of tea, you can get the same info from Mike Mitzer, of the EPA, by calling (703)305-5883.

### Bee Schools

**Eureka** - Experienced beekeeper and lecturer, Dick LaForge, will be teaching. "Practical Beekeeping" through Humboldt State University Extended Education. Classes will meet in the Wildlife Building at HSU Tuesday evenings, from 6:30-8:00, February 17 through May 12. A couple Saturday field trips to the bees will be included, weather permitting.

Topics covered in the course include: honey bee biology,

social organization, annual population cycle, management of honey bee colonies for pollination and honey production, and obtaining other products of the hive. Students will develop hive manipulation skills by practicing on University hives. Those wishing to keep bees will obtain, assemble, paint, and have their equipment ready for bees in April.

If this course sounds attractive to you, contact Humbolt State at (707)826-3731 and ask to be en-rolled in "Practical Beekeeping." The cost for the 13 lecture, 2(?) field trip course is only \$60, a real bargain.

**Sacramento** - Experienced beekeeper and lecturer, Randy Oliver, will be teaching a comprehensive class on "Beginning Beekeeping" on Saturday, March 7, 1998, from 8:00 a.m. to

4:30 p.m. at the Sacramento County Cooperative Extension Agricultural Auditorium, 4145 Branch Center Road. If the first session sells out, a second session will be scheduled for Saturday, March 21st. The cost is \$25 per person or \$40 per family. The Sacramento Area Beekeepers' Association is sponsoring the class(es). To register or obtain more information contact Nancy Stewart at (916)451-2337 or Pam Hill at (916)773-1693.

**UC** - Extension Apiculturist Dr. Eric Mussen, will be teaching a session in "Intermediate Beekeeping" on Saturday, April 4th, at the same location as mention above. This course will focus on potential beekeeping problems, and their solutions. Weather permitting, colonies will be examined for visible signs of problems. Bring a veil if you intend to visit the bees. Again, the prices and registration contact are the same as for the Beginning Session(s) listed above.

**Burnaby, British Columbia,  
Canada** - Bee Master Short Course,  
1998. Dr. Mark Winston has  
rounded up an excellent group of  
four Canadian and three U.S.  
apiculturists to help teach the  
five-day, comprehensive course in  
beekeeping. It all starts on  
Monday morning, February 16th,  
and ends Saturday, February 21st,  
with an exam for certification as  
a Bee Master. Even if you don't  
care about certification, the  
course is well worth the \$145  
registration fee. If you wish to  
attend the banquet, there is an  
additional \$20 fee and parking on  
campus is \$13 more.

Just about every topic you can  
imagine is covered beginning with  
"The Essence of Royalty" and  
ending with "Commercial Honey  
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from Hive to Barrel." There are  
24 other presentations sandwiched  
in between, as well as a quick  
campus tour.

For a fact-filled brochure on  
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Sincerely,

ERIC MUSSEN  
ENTOMOLOGY DEPARTMENT  
UNIVERSITY OF CALIFORNIA  
ONE SHIELDS AVENUE  
DAVIS, CA 95616-8584 [(530) 752-  
0472]  
[FAX (530) 752-1537]  
E-mail:ecmussen@ucdavis.edu

Eric Mussen  
Entomology Extension  
University of California  
Davis, CA 95616`